THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., AUGUST 1, 1889.

THE WEEK IN IRON CIRCLES.

General Features. Crop reports, upon which so much depends in all lines of business, and not least in the iron and steel industry, are as fickle as April weather, these days. Each day brings its conflicting report, which no doubt has the desired effect upon the stock markets, but the fact remains that business goes on as usual, and there is scarcely a line of industrial enterprise that is not well employed. While there has been little change in Western pig iron markets during the past week, the strengthening tendency is still felt in all directions. Our advices from Chicago are to the effect that Lake Superior charcoal iron is in fair demand; an advance of fully 50 cents per ton has been established over the prices made to large consumers recently. The sales of Southern irons are quite numerous, and at the full market prices. The situation is encouraging to manufacturers, and everything points to a better state of things in all branches of business. An improved condition of things has been manifest at Cincinnati the past week by increased sales, a firmer price and a generally better tone to the market. The firmer price attaches more particularly to rolling mill grades, which are closely sold up to a considerable extent, and contrrcted ahead, although produced in their usual qnantity. Foundry irons participate in the better demand, but are irregular in price and closely contest all large orders. The nature of the buying indicates that the large consumers are preparing for a heavy Fall and Winter business, and points to a healthy condition for the iron trade. At St. Louis there has been a gradual strengthening of the tone of the market, and sales are made more freely at an advance of 50 cents to 75 cents per ton. During the past week quite a number of sales of 200 to 500 tons are reported, As the pipe works and other large consumers are well supplied, the transactions are for comparatively small lots. There is a scarcity of Southern soft irons, and the furnaces have advanced prices $1.00 per ton. Indications continue favorable for a good business this Fall in nearly all lines of trade in the Southwest. Louisville reports: Some agricultural concerns have laid in a supply of the different grades, which is about the only feature of importance in the local field. Inquiry, however, from the outside is fairly good, and the volume of business would be larger if furnace companies would sell more liberally. This has been especially the case with Southern coke irons, which are offered in light supplies at present. The cheaper grades of charcoal iron have shared a fair portion of the week's business. Shipments on orders previously booked are heavy, and collections have been large. Our Detroit correspondents (W. F. Jarvis & Co.) write: "There is little change in the market since our last report of a week ago. Considerable buying has been done, especially of Lake Superior charcoal, but the majority of sales have been for small quantities. Several furnaces of both coke and charcoal, have advanced quotations, thereby practically withdrawing from the market, most of them being entirely sold up for the next sixty days, and not desiring to sell for longer deliveries at prices other furnaces will accept. We report a steady and firm market." We are pleased to report that, at Pittsburgh, there has been a constantly improving tone to the pig iron market since last report, and prices have stiffened up accordingly. Forge iron is especially active, at an advance of twenty-five cents per ton, and some parties who are well sold up are holding off for higher figures.

Iron Ore. Continued heavy shipments, far in excess of the corresponding period of last season, are the principal characteristics of what may well be called a prosperous time for ore producers and sales agents, as well as for the vessel interests. The condition of the ore trade from the day of its opening, ninety days ago, has been told so fully and in detail, that what remains is of but proportionally little weight, compared with the gigantic volume to which the ore business has attained this season. As a general thing, the mines are sold up, the odds and ends distributed over the entire mining region being of such a heterogeneous character as to make further sales impracticable; but along with thirty or forty two- and three-thousand ton lots of non-Bessemer ores, there are still some larger quantities of standard Bessemers to be had, which will find a market without any trouble. There is, for instance, considerable Ashland ore unsold, and its owners do not seem to be in any hurry to part with it. Some time ago, when other ores of the same grade were sold at $5, Ashland was held up to $5.25, and it is there still—what is left of it. There is also ten to fifteen thousand tons of Republic left at $5.75. Among other ores yet in the market is some Aurora and a little Brotherton, last quoted at $5.25, but for which the owners decline to make a price at this time. Vessel freights are holding up steadily, and for the present no advance in charters is anticipated. The coke question is one which will soon again interest the trade, owing to the threatened strike to go into effect to-day.

Pig Iron. The stagnant condition of trade, which for many months has depressed the market, is giving way to a slight ripple of improvement, and the market is exhibiting unmistakable signs of a healthy betterment. Not that any general advance can be reported, but furnace-men, in view of the many inquiries, feel justified in asking a quarter more here and there, as the case may warrant it, and they generally get it. It is the consumers who now appear as anxious to buy as the producers were a little while ago to sell, and this reversed condition of affairs necessarily contributes to the changed aspect of things. There is great demand for pig iron, more especially for long future delivery, but the wants of consumers seem to call just now for the best qualities of foundry and forge irons only. Indeed, mill iron does not seem to be made fast enough, and in price it is barely a dollar below a No. 1 foundry. Three firms booked on Tuesday of this week 5,600 tons of orders, and the business of the week will easily double that figure. Bessemer pig sells at from $17.50 to $18.00, and is in excellent demand. Little is heard of Southern iron, which so recently came into this market, and the increased railway tariff is likely to retard that class of importation in the immediate future.

Merchant Iron. A sharp advance is noted in bar iron, which, selling very closely at $1.60 at the mills, can not be bought here in car loads at less than $1.65, and out of store at $1.70. To the average consumer this makes an increase of $2 a ton. The demand is strong, and trade brisk. Sheets, especially in the thinner gauges, are very scarce, the mills asking fancy prices for reserve stocks. No. 24 easily brings $2.85, and No. 27, $3.10. There is also quite a good deal of inquiry for the heavier gauges of plate, especially Nos. 6 and 8.

Scrap Iron. An advance in bar iron is sure to bring with it a rise in old American rails, and $23 is about the lowest price for which that commodity may now be purchased. There is little demand for railroad scrap of all grades, but two sales are reported of selected axles at $24 and $25, respectively. Car wheels are not much sought after, the last quotations being $17.50.

Hardware. There is a marked falling off in the wholesale trade, usual at this time of the year. Locally, there is still a fair demand in shelf goods and builders' materials. Denuded of the mystery of averages, cut nails are worth $1.80 in car loads for iron, and ten cents more for steel.

A MARVELOUS GROWTH OF TONNAGE.

The following table of per cents. of increase in the traffic on the chain of Great Lakes, for the period from 1882 to 1887, will no doubt be of interest from an economic and commercial point of view:

	Per cent.
The number of vessels increased	96
Registered tonnage of vessels increased	98
Freight carried "	170
Passengers carried "	11
Coal carried "	214
Flour carried "	357
Grain carried "	467
Iron ore carried "	153
Lumber carried "	99
Copper carried "	37

Has the growth of vessel tonnage kept pace with this marvelous increase? Despite the fact that $12,000,000 worth of new vessel property has been set afloat on the lower lakes within the past two years, there are those who believe that there is still a pressing demand for tonnage of modern construction, as witness the recent orders of the Minnesota Iron Company to Cleveland ship-builders for four steel steamships, and by the Lehigh Valley Transportation Company for two more boats for their splendid line. It is not sufficient that the lost tonnage of each season should be replaced, or that obsolete vessels should give way to those of more modern construction; there is, besides, a great and growing demand for vessels to carry the immense annual increase in freight destined for lower lake delivery. Herein is the basis for great hope for the future of our ship-building industry.

THE NEW MYSTERY OF RAILWAYDOM.

While interest has been concentrated upon railway developments in the South and Southwest, a new Mystery has appeared upon the scene. Not content with spanning the continent to the north of us, it has begun a systematic arrangement with connecting lines penetrating the United States from the Northwest, with the evident intention of reaching out toward the seaboard, until its five iron fingers grasp, respectively, the great seaports of Montreal, Portland, New York, Philadelphia and Baltimore. Already it controls the great *entrepots* of the Northwest: Duluth, St. Ignace and Gladstone, and now the question arises, Where will it next strike? Given: a great railroad system controlling the immense traffic of the Northwest, as well as the chief shipping ports of the Lake Superior region, what lower lake port will furnish it the most direct route to the seaboard? Naturallv, Buffalo and Cleveland will first attract attention, and that each has strong claims for recognition there can be no doubt. A study of the map, however, brings out some interesting and important facts regarding the situation which have generally escaped attention.

It need hardly be said that distance is an important factor in all that concerns commerce and marine transportation with the Northern latitudes of the great lakes of Superior, Michigan and Erie. With only six months of navigation, it becomes a vital question, How can the water distance be reduced to a minimum? The vast improvements made of recent years in vessel construction have done much to solve the problem, yet the fact remains that nearly a thousand miles of water intervenes between the shipping ports of the Northwest and Buffalo, requiring an expenditure of time and fuel in reaching destinations at once annoying and expensive. If we seek for a material lessening of distances, as well as a more direct route to Atlantic ports, we come inevitably to Cleveland or Sandusky. While local considerations might induce us to an immediate advocacy of the former port, a study of some of the claims of the latter presents several points of extreme interest. The following table of distances will serve to elucidate the question:

COMPARATIVE DISTANCE TABLE.

MARINE.

From—	To— Sandusky.	Buffalo.
Duluth	801 miles.	997 miles.
St. Ignace	369 "	556 "
Gladstone	480 "	666 "

RAIL FROM SANDUSKY.

Via—	To— New York.	Philadelphia.	Baltimore.
Lake Shore and New York Central, etc	689 miles.	679 miles.	665 miles.
Ashland, O., Erie Railway	715 "	814 "	..... "
Loudonville, O., Pennsylvania Railroad	573 "	585 "	562 "
Coshocton, O., Pennsylvania Railroad	683 "	595 "	572 "
Baltimore & Ohio, Lake Erie Division	..... "	..... "	610 "

Of the above connections, the one missing link (120 miles), is the road from Sandusky *via* Ashland to Coshocton, which is now under way. Taking the water journey alone, the distance from St. Ignace (Straits of Mackinac) to Sandusky, 369 miles, can be made in less than half the time it would require to move a vessel to Buffalo. Not only this, but larger vessels can be utilized between Gladstone and St. Ignace than can be used from Duluth, owing to the navigation of St. Mary's River and the Sault Ste. Marie Canal, which limits as well as governs the draft of water. Finally, Sandusky is free from the northeast and southwest winds which are so detrimental to rapid egress and ingress at Buffalo.

At this stage in the development of our lower lake port facilities, when the work of straightening the channel at Sandusky is being vigorously prosecuted and the various projected terminal and railroad improvements at that port appear to be on the point of materializing, comes the important inquiry, Has the Mystery of Railwaydom any interest in these matters? As we have said, its connections penetrate to the grain ports of the United States; and even now it is knocking at the gate of Council Bluffs and Omaha, looking to the Southwest, whilst in the East it has boldly approached the Niagara River and will leap this barrier into the arms of the Delaware & Lackawanna Road, and thus enter New York harbor. Has it any plan for a great midland route, connecting with all the trunk lines, enabling it to reach the whole Atlantic Seaboard by the most direct and reliable connections by rail? It may be so. Who knows?

THE CENTRAL WEST AS AN IRON PRODUCER.

While we are giving the South all due credit for her wonderful advances in the manufacture of iron, it may be in order to remark that Ohio and the Central West are still on deck. The figures of the American Iron and Steel Association, to which reference was made in our last issue, showed the product of the Southern States for the first half of 1889, in comparison with the last half of 1888, as follows:

States—Net tons.	Second half of 1888.	First half of 1889.
Alabama	279,796	364,346
Tennessee	145,114	147,401
Virginia	104,901	112,328
West Virginia	49,658	72,775
Kentucky	35,523	23,865
Georgia	15,739	11,338
Maryland	11,356	10,233
Texas	3,619	1,411
North Carolina	1,300	922
Total	647,006	744,619

From the above it will be observed that the growth of the Southern States in the production of pig iron in the first six months of 1889 is confined to four States, and that each of the other five States show a decrease.

Now let us turn to the Central Western States. The production of Ohio, Indiana, Illinois, Michigan, Wisconsin and Missouri, in the last half of 1888 and the first half of 1889 was as follows:

States—Net tons.	Second half of 1888.	First half of 1889.
Ohio	575,282	602,476
Indiana	7,960	7,806
Illinois	284,787	282,153
Michigan	106,673	100,363
Wisconsin	64,560	74,065
Missouri	30,994	42,795
Total	1,070,256	1,109,658

It may sound strange to say that Ohio produced, in the half year just closed, nearly as much pig iron as the entire South, even with the notable increase in that section, but so it appears from the official returns. As for the five Western States mentioned, their production was one and one-half times that of the nine Southern States, given in the first table. Of course it can truly be said that the South is only a recently entered competitor in the iron markets of the country, and hence her record is all the more surprising. True, but at the same time it should not be forgotten that the Central West is quietly doing a great deal better, while Pennsylvania is so far in advance that nobody thinks of relegating her to second place.

OUR London exchanges contain the prospectus of the new "tin-plate trust," which has acquired three of the largest works in Wales. The share capital of the new syndicate is (in round numbers) $750,000, with $600,000 5 per cent. debentures in addition. The purchase price was $1,023,250. The three firms represented in the deal are: Messrs. E. P. and W. Baldwin, of the Wilden and Swindon Iron and Tin Plate Works, established in 1848; Messrs. Hatton, Sons and Company, of the Bradley and Broadwaters Iron, Steel and Tin-plate Works, established about 1833; and Messrs. Stephen Thompson and Company, Limited, of the Manor Iron and Tin-plate Works, established by the late Stephen Thompson in, 1876. The average annual profits of the three firms collectively are put at $83,385.

THE iron trade has been "revolutionized" so many times that it may be well to take in gradually the wild statements which have recently come out of the Wild West, in the latitude of Chicago, about rolling molten metal. That some really wonderful results have been reached by this new process, had been duly chronicled by the technical press long before the daily papers got hold of it, but we are not yet prepared to believe that steel rails can be manufactured by it, and that at reduction in cost of $10 per ton. We would advise steel rail manufacturers not to throw away their present

plants until the Chicago reporter looks into the matter a little more closely.

OWNERS of American steel plants are advised to put up lightning rods tipped with gold—gilt-edged, as it were—if they would have British capitalistic lightning strike them.

OUR Philadelphia contemporary, *Iron*, shows immense improvement under the new management. The days of poorly printed trade papers seem to be rapidly passing away.

THE BOOKWALTER-ROBERT STEEL PROCESS.

ARMY AND NAVY JOURNAL.

Some months since, a brief mention was made in "Ordnance Notes," of the circumstance that ex Governor James W. Bookwalter had purchased in France the patents of an improvement upon the Bessemer system of steel production, and was about to install at Springfield, O., a small plant, with a view to introducing the process in the United States. Recognizing the characteristic desire of a clever business man to avoid publicity as to an enterprise during its tentative stage, no further allusion has been made to the matter; but the development has been so creditable to the American exploiter, and the results secured are so important to the steel industry, and of such essential interest to our readers, that we very gladly publish such facts as have come to our knowledge.

The very important improvement upon the Bessemer principle of producing steel in converters, known in the United States as the Bookwalter-Robert steel process, should be credited originally to Mr. Gustave L. Robert, managing director of the steel works at Stenay, in the Department of the Meuse. The Stenay Works has a European reputation for general excellence of output, and especially for the perfection of its castings as to material and quality. Steel rails being a large integer in the yearly production, the expert head of the establishment has naturally given constant attention to his Bessemer plant, with a view both to improving the standard of product and economizing in the details of the process, so that the invention is the legitimate outcome of long-continued, serious study, and not, as often happens, the inspiration of a lucky moment. As one writer upon the subject remarks, impressed by the obvious simplicity of the improvement, it is nevertheless "the only wonder that he never thought of it before."

While the molten iron is undergoing its change into steel, in the Bessemer converter, it is known to many of our readers that, though separated from the furnace in which the melt was effected, the heat to which it is subjected is not only continued, but increased by the forced admission of oxygen from the atmosphere into the metal bath. This oxygen enters at the bottom of the converter, by a forced blast, through tuyeres having direction perpendicularly upward, through and against the mass of metal in fusion. The tendency of a forced blast, acting normally against a mass heavy, unyielding and incompressible, in thus forcing its way upward, is to violently agitate the whole body in a single and uniform direction, with the natural effect of segregating impurities and resisting anything like homogeneous conditions. This feature of the forced blast, while it has been the essential property and characteristic of the Bessemer process, has also been its defect—a defect which has limited its possibilities to rapid and relatively cheap production of one type of metal only.

The improvement, which Mr. Robert's extended practical experience and receptive observation have suggested in the Bessemer process, touches essentially the faulty disposition of the forced blast; instead of arranging a battery of tuyeres at the bottom of the converter, he admits the blast upon its side, horizontally with the upper surface of the melt. Thus the oxygen, impelled with great force, enters the converter at the edge of the fluid mass and similarly agitates it with great violence, but, so far from a segregating effect, creates homogeneity, by first banking up the slag and other impurities on the top and against the opposite interior of the converter, and coincidently causing a rotary motion of the melt, throwing it over and over in a circle as long as the blast is continued, and exposing every part of the metal to the influence of the air. Practically, this is a more perfect puddling process than can be operated by manual or mechanical means, and it must not be forgotten that Krupp vaunts his puddled steel as the best factor of the crucible charge for his heavy gun castings.

It is not necessary to detail the chemical action upon the molten metal, which succeeds the entrance of the oxygen, the decarbonization being effected the same as if the blast were admitted at the bottom of the converter, and the ferro-manganese added similarly at the conclusion to re-carbonize the melt. The heat created by the absorption of the oxygen is, however, considerably more intense than under the conditions of the ordinary process. This produces two very important results; the period of conversion, averaging half an hour, is shortened several minutes, and the fluidity of the metal is much more perfect, an unquestionable incident to its greater homogeneity. This perfect fluidity is so pronounced that, in its quiescent state, the melt retains its condition for a considerable time, and can be poured with great deliberation into the ladles of various capacities and out of their nozzles into the moulds or other receptacles, without leaving "skulls," and with all the lambent flow of cast iron.

It is well known that Krupp utterly discredited the qualities of Bessemer steel for any other uses than rails and constructive appliances. In the recent volume, "Krupp and De Bange," translated from the French of Monthaye by Major Michaelis, U. S. A., Prof. Fremy, the great German authority on gun-metals, is quoted as follows:

"Can this metal be used for guns? This question is of great importance to ordnance officers, for Bessemer can be made cheaply and quickly—important considerations now-a-days. But the structural applications of Bessemer steel have a limit, and I confess I dare not recommend its use for gun-metal. I have experimented a good deal with the converter, I have watched its workings for many months, I know how a low and strong metal can be obtained; still, I must say that this process, so simple, so direct, yielding almost at once large ingots of steel, does not yet guarantee that constancy of product so absolutely essential in gun-making. Many things combine to make Bessemer irregular, and the converter does not permit the same examination of ingredients as does the crucible. As regards impurities in the iron, it must be borne in mind that the charge is treated less than half an hour, consists of tons of metal, and that consequently the time must be too brief to insure the complete elimination of anything injurious to strength."

"We thus see," says Monthaye, "how Fremy disposes of Bessemer as a gun-metal, but we must in fairness add, that this opinion is accompanied by a proviso, a prudent precaution against what the future may have in store for us. 'By continued careful study of the Bessemer process, I have no doubt but that the serious defects described may be overcome.'"

The results of the Bookwalter-Robert improvement—though we do not pretend to say they have absolutely overcome the defects suggested by Prof. Fremy—certainly seem to be flattering approaches in that direction. Gov. Bookwalter has had but a few months to develop his enterprise in; yet he has set up his plant and produced in a Bessemer converter specimens of steel of a uniformity and excellence of standard, and suited to a variety of uses, that are certain to change any old or preconceived ideas of the possibilities of Bessemer. Instead of a metal, which never could be forged, but only rolled, and which was only available for rails, beams, etc., he shows the most perfect castings, admirable for sharpness and finish, bars of tool steel of the finest temper, horse-shoes, axes, and, in fact, a variety of instances of usefulness more comprehensive than has been credited to the average open-hearth product. The following figures from a test of a bar rolled directly from an ingot are significant as to the qualities of a gun-steel, though the test was made at an early stage of the production in this country.

Carbon, 35; area of cross section, .18; breaking load, 18,800 lbs.; tensile strength, 101,000 lbs.; per centage of elongation, 25.6; per centage reduction of area, .50; elastic limit, 60,000 lbs.

A mill steel, carrying less than .05 of carbon, similarly tested, gave the following report:

Elastic limit, 35,600 lbs.; tensile strength, 59,000 lbs.; elongation, .44 per cent.; reduction of area, .67 per cent.

The maximum capacity of the Bookwalter-Robert mill, at Springfield, is 100 tons of metal per day. At Detroit, the Michigan Steel Co., a reorganization of the old Detroit Spring-steel Co., has adapted its Bessemer plant to the production of steel by the improved process, and is able to turn out 200 tons during the 24 hours. The Chester Steel Casting Co., of Chester, Pa., one of the best-known organizations in the country, is also making such alterations in its plant as are necessary, with a view to an output daily of 100 to 150 tons.

The relative economy of the new process, in comparison with the old Bessemer, is a conspicuous feature of the Bookwalter-Robert improvement.

The Steel Rail Situation.

The demand for steel rails has been quite steady for several weeks, and the mills are now in such condition that it is difficult to place orders for delivery earlier than September. Negotiations are pending for further lots, and, if projected railroad schemes now maturing can be financed, some large orders would be in the field. Up to the 1st of July, the manufacturers reporting to the Board of Control had booked orders, since January 1, for 963,550 tons. The one mill outside of the Steel Rail Association, the Allegheny Bessemer, very probably sold enough rails to make the entire quantity sold at least 1,000,000 tons. The true criterion of the condition of the rail trade, however, is the quantity shipped. The following table shows the tonnage of steel rails, weighing 50 pounds per yard and upward, shipped by each mill from January 1 to July 1, on account of 1889 allotments, as reported by the Board of Control:

Mills.	Tons.
Illinois Steel Co. (North Chicago, Joliet and Union combined)	139,574
Edgar Thomson	134,700
Scranton	73,341
Lackawanna	62,763
Bethlehem	48,877
Pennsylvania	44,532
Cambria	29,240
Cleveland	11,368
Troy	2,280
Worcester	None
Western	None
Springfield	None
Total	546,675

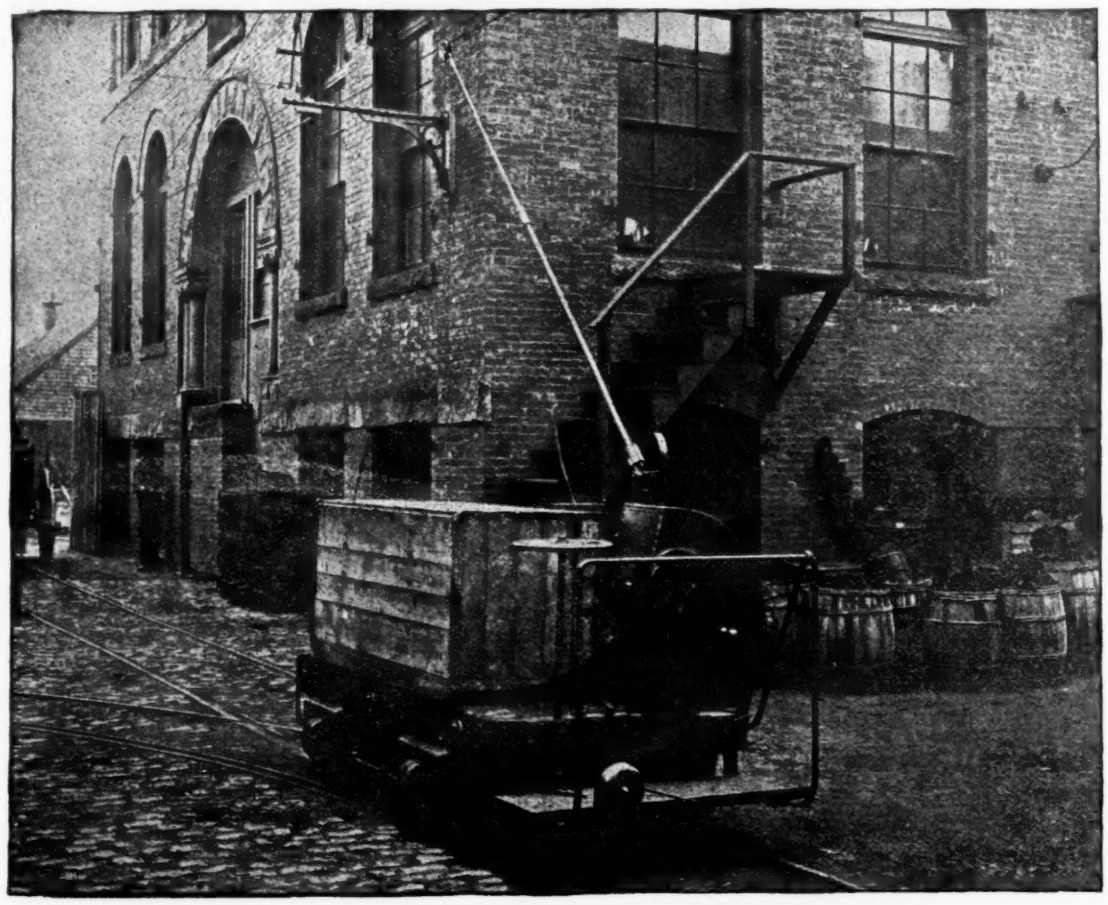
To this total the shipments of the Allegheny Bessemer would have to be added to get the entire quantity for all the mills of the country. Even then, the total would fall short of 575,000 tons. The sales, up to July 1 of last year, were 934,987 tons, and the deliveries 585,558 tons. The year previous up to the same date the sales were 1,695,055 tons, while the shipments were 907,351 tons. These figures clearly illustrate the different condition of the rail trade this year. Prices at present range from $27.50 to $28 at mill.—[Iron Age.

A Monument to America's Greatest Engineer.

The New York *Engineering and Mining Journal* says: "It will be recollected that some time subsequent to the death of Alexander L. Holley, the American Institute of Mining Engineers, the American Society of Civil Engineers, and the American Society of Mechanical Engineers raised a fund of $10,000 for the purpose of erecting a suitable monument to his memory to be placed in one of the parks in this city. A bronze memorial bust was decided on, and the making of the design was entrusted to Mr. J. Q. A. Ward, the well-known sculptor. We are glad to note its approaching completion. About a week ago it was successfully cast by the Henry Bonnard Bronze Co., in West Sixteenth street, this city. It is now in the finishing shops, and when completed, will be dedicated with appropriate ceremonies by the three societies.'

THE ELECTRIC ROAD AT THE THOMSON-HOUSTON FACTORY.

A need of better facilities for the handling of supplies and products in large manufacturing establishments has led to the adoption of the electric motor as shown in the accompanying illustration. A greater part of the large mills being supplied with electric lighting systems, renders this an easy matter, and it is safe to predict that before long the electric tramway will come to be considered a necessary feature in mill equipment. The Thomson-Houston Electric Co. has already equipped several tramways, and has contracted for others which will soon be put in operation. The tramway car at the company's works, in Lynn, Mass., is used for carrying heavy machinery to different parts of the factory, and its use permits the handling of apparatus with much greater ease, in less time, with less labor than could possibly be accomplished by any other method. The car is equipped with two three horse power motors, and easily carries up a grade of 13 per cent. a load of 5 tons, while from 8 to 10 tons can be carried on a level. The motors receive their current through an overhead wire from one of the generators in the factory.



THE ELECTRIC ROAD AT THE THOMSON-HOUSTON FACTORY.

ACCORDING to a correspondent of the *Artisan*, a simple plan preventing sheet iron stacks from rusting is as follows: If before raising the new chimney, each section, as it comes from the shop, be coated with common coal tar, then filled with light shavings and fired, it will resist rust for an indefinite period, rendering future painting unnecessary. In proof of this he cites a chimney which was erected in 1866, treated as above described, and is to-day as bright as it was the day it was raised, whithout having a particle of paint applied since. The theory by which he accounts for this result is that the coal tar is literally burned into the iron, closing the pores and rendering it rust proof.

A NEW ELECTRIC COAL MINING MACHINE.

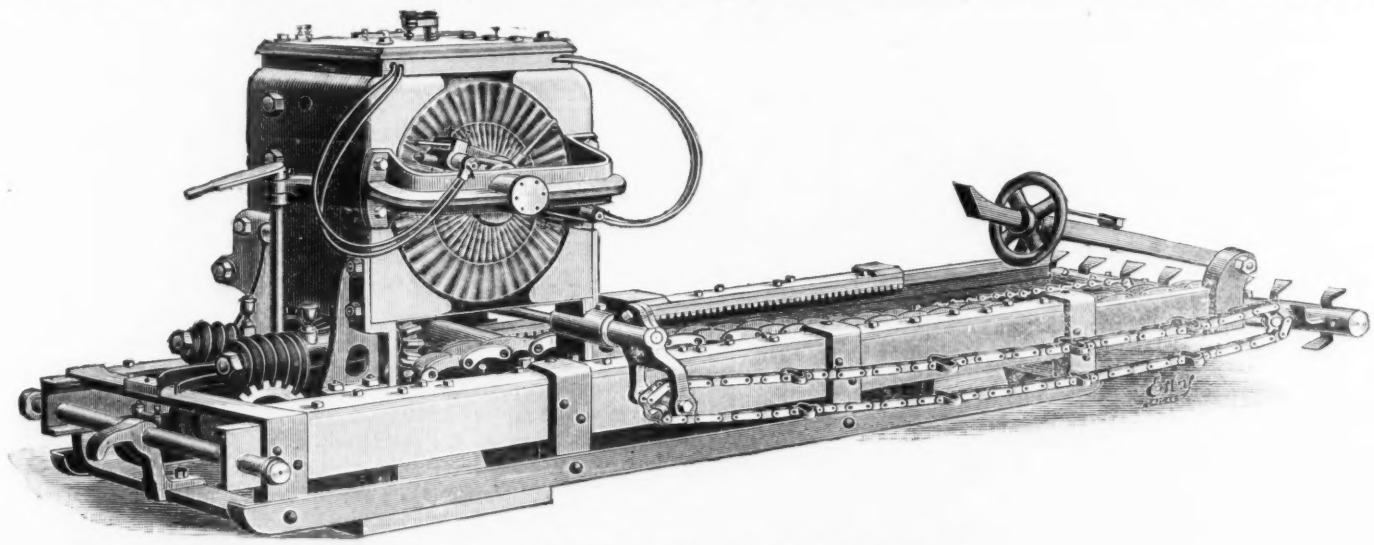
The use of electricity is fast superseding other means of transmitting power. The ease and facility with which it can be conveyed, and the safety with which it can be used, demonstrates the fact that electricity is the best and most economical power to use in coal mines.

In this age of progress, coal mining machines for undercutting, power drills for drilling, electric motor cars for hauling, and mines lighted by incandescent electric lamps, will soon be in use by the most progressive coal mine operators.

The Jeffrey electric coal mining machine, which we illustrate on this page, is run by an electric motor, attached direct to the machine, using not to exceed a pressure of 220 volts. This voltage is pronounced by expert electricians as perfectly safe from any injurious consequences. The machine runs quietly and steadily; does its work rapidly, taking an average of three and one-half to four and one-half minutes to undercut five to six feet deep, three feet wide. The machine can be handled easily by the two men required to run it. Will cut in either the coal or in fire-clay bottom, if desired. Will undercut from 600 to 900 square feet of floor per day of ten hours. The machine is simple, strong and compact; a man of ordinary intelligence can understand and handle it with a few days' instruction. All parts being made from templets, are interchangeable.

The Shawnee & Iron Point Coal & Iron Co,, Shawnee, Perry county, O., are now operating with these machines, and are lighting their mines and hauling their coal by electricity.

The manufacturers of these new coal mining machines are the well-known Jeffrey Manufacturing Co., of Columbus, O. They have been experimenting on this new departurefor the last three years, and are to be congratulated on their final success.



A NEW ELECTRIC COAL MINING MACHINE.

THE Commissioner of Patents has just decided on the final appeal the case of the patents on the cast steel car wheel, in favor of the Fowler Cast Steel Car Wheel Co., of Chicago. The decision affirms that of the Board of Examiners and of Examiner of Interferences. It is said that after the Fowler wheel had been publicly produced,the Pittsburgh company began producing car wheels of a substantially similar character, and by methods secured under the Fowler patents. The Pittsburgh company subsequently became the assignee of Clifton B. Beach, of Cleveland, O., who had before received certain letters-patent, pertaining to car wheels of a different type. The Commissioner in his decision says that an interval of nearly four years had elapsed between the abandonment of the claims of Beach's first application and the filing of the application involved in this interference. Meanwhile, Fowler had conceived the invention in controversy, reduced it to practice, entered upon the use of it on an extensive scale, and applied for and obtained a patent. Therefore, the decision was rendered in favor of the Fowler company.

EVERY one of the intelligent readers of THE IRON TRADE REVIEW, even though learned in electric lore, should be interested in President Henry Morton's article on "Electricity in Lighting"—the third in the series, which was begun in the June issue of *Scribner's Magazine*. Professor Morton takes the reader with him into the great factories where the dynamos and glow-lamps are actually made, and entertainingly explains the process. Many of the illustrations are from photographs taken at the factories while the men and women were at work.

SUNSET COX: "Last year our corn crop was 2,000,000,000 bushels. It was raised upon 75 672,763 acres. It would require 3 000 000 cars, with over 60,000 locomotives, in a train to draw it to the seaboard. It would take a year to pass such a train through Chicago."

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

MENOMINEE RANGE.

The Commonwealth's new "swamp" find has been almost entirely uncovered, only one corner remaining to be stripped, and this will be finished in about ten days. Three hoisting derricks are in position, one of which has been in operation during the week, another one beginning the work of hoisting ore yesterday, and the third, which is now employed in the work of stripping, will be taking out ore in a week or ten days. Twelve hundred tons of ore have already been taken out of the pit, but at least 600 tons per day will be hoisted when all the derricks are brought into use.—[Mining News, Florence, Wis., July 27.

Capt. W. R. Calhoun has lowered the water eighty feet at the Caledonia, and now that he has a new boiler in place, expects to have the remaining twenty-five feet of water pumped out by to-morrow night. He is now exploring in the vicinity of the mine, and is sinking two or three test pits on the ledge. As soon as the mine is thoroughly cleaned up, drifting will probably commence with a view of locating the vein.—[Mining News, Florence, Wis.

The Ludington mine is sending out from 400 to 500 tons of ore per day, and if nothing unexpected occurs, should continue to do as well during the remainder of the season. The diamond drill work has been fairly satisfactory, and the two unopened levels of A shaft, the 10th and 11th, will be opened out at once, and the sinking of the shaft continued. The ground around No. 1 shaft at the upper levels continues to settle, and it will be necessary, as soon as the shipping season closes, to do considerable work in the shaft.—[Current, Norway, Mich.

We learn from the Norway *Current* that the crosscut at the Aragon has been driven twenty feet across the ore formation, with seventeen feet in clean ore on each side of the crosscut, the west side being jaspery. Samples of the ore have been analyzed, giving a high percentage of iron with only a trace of phosphorus. Contracts have been let to sink the shaft another lift and to drive east in the ore. The crosscut will be continued until the hanging wall is reached. A drift is to be started soon.

Exploratory work will soon be commenced on the west half of section 25, 43 35, just north of the Stambaugh mine. It is expected that the Stambaugh vein extends north along the river into the property.

GOGEBIC RANGE.

The Germania has three shafts, all working, and is raising from 500 to 800 tons of ore daily. No. 3 shaft has now reached a depth of 580 feet, and No. 4 is down 300 feet. New shaft houses are erected over both of these that are admirably arranged, each having, besides the ore pockets, a large rock pocket holding 48 tons, so that only one lander is required and the taking away of rock is greatly facilitated. The shafts are all connected by a drift that is now 1,300 feet in length, all in an excellent quality of ore, the width of vein running from 20 to 50 feet. The Germania opened the season with a stock pile of 10,000 tons of ore, 7,000 of which still remains, and has shipped so far this season 43,000 tons.—[Pick and Ax, Bessemer, Mich.

The Newport & Lake Superior Land Co., which has recently taken possession of the Iron King mine, has changed the name of the mine to "The Good Hope," and the property is again being worked.

MARQUETTE RANGE.

Joseph Kilpatrick has struck a vein of fine ore to the east of the Volunteer mine. A diamond drill has been searching for the vein for some weeks past. This is encouraging and bids fair to be of considerable importance to the Cascade range.

The Pittsburgh & Lake Superior Iron Co. has been doing some extensive exploratory work, since a recent sale of a portion of the property, and from present indications will soon have other and large mines to sell or work. One of the drills being operated on Section 29, a short distance east of the office, penetrated a body of clean ore 286 feet from the surface, on an angle of 60, and passed through 27 feet of it, and then through ten feet of mixed into a handsome quarzite, and is still being run, with the expectation of striking a body of soft ore. On 32, a short distance south of the location of the drill above noted, a test pit was bottomed on Monday in a rich quality of hard hematite, much to the surprise of the managers, who were sinking to the ledge with a view of locating a drill. The prospect of opening a valuable mine at this point at trifling expense is flattering indeed. Besides these, explorations of other portions of the vast property is going on with much promise, as we understand.—[Iron Herald, Negaunee, Mich.

Developments on the East Jackson property, (formerly Peddill) are of a highly encouraging character. Some days ago, a deposit of hard ore was struck near the bottom of the old Peddill shaft, by breaking through what was supposed to be the hanging wall and a drift driven some seventeen feet in a vein of first-class hard ore, the same that has given the Jackson such an excellent reputation throughout the iron world. On Friday last, a shaft being sunk on the property directly in front of the Peninsula Brewery, was bottomed in a deposit of hematite, the quality and conditions of which leave no room to doubt that the company are about to realize the deserved reward of their enterprise—[Iron Herald, Negaunee, Mich.

Death of the "King of the Vermilion Range:"—

Charlemagne Tower, the Philadelphia millionaire, died last week, at Waterville, Oneida county, N. Y. He was 81 years of age, and died of paralysis after a few days' illness. He was worth $25,000,000.

Mr. Tower's connection with the development of Minnesota iron ore lands gave him his greatest reputation. It was fifteen years ago, when the discoveries of ore were made near Duluth. After thorough investigation, the shrewd capitalist bought 20,000 acres of land, and constructed a railroad to carry ore to the lake. Two Harbors, its terminus, was laid out by him. It was not till 1884, that the first ore was shipped, but since then the richness of the Superior deposits has become world-famous. In 1887, Mr. Tower disposed of his ore properties to a syndicate.

On June 5 of that year, at the office of the Fidelity Trust & Safe Deposit Co., in Philadelphia, he handed over to the syndicate the stock and bonds of the Duluth & Iron Range Railroad and the title deeds to some 20,000 acres of land, and received in return certified checks on banks and financial institutions to the amount of over $6,000,000. Not since the Pennsylvania Railroad bought the Philadelphia, Wilmington & Baltimore road, had there been a cash transaction in Philadelphia of such magnitude.

In the Northern Pacific Railroad, Mr. Tower was also extensively interested, and made a fortune in that quarter alone. With Henry C. Villard, C. B. Wright and others, he reaped enormous gains, and at one time owned $3,000,000 worth of the company's stock. Two towns bear Mr. Tower's name—one on the shores of Lake Superior, the other in the anthracite coal fields. He leaves four daughters and one son, Charlemagne Tower, Jr., who is vice-president of the Pennsylvania Finance Co., and has extensive interests in the Minnesota ore lands. The son resides on Rittenhouse square, Philadelphia.

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior for the season of 1889, up to Wednesday, July 24th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	8,278	Humboldt	7,782	Prout	1,872
Barnum	2,383	Jackson	32,429	Queen	22,770
Braastad	60,452	Jackson, pit 7	4,756	Republic	160,818
Buffalo	15,023	Jackson, pit 8	12,465	Republic Reduction Co.	12,020
Buffalo, South	2,774	Jackson, South	6,532	Salisbury	7,845
Cambria	31,174	Lake Superior	21,157	Salisbury Bessemer	9,954
Champion	101,390	Lillie	18,840	South Buffalo	28,439
Cleveland	107,020	Lucy	7,106	Superior	51,014
Cleveland, Hematite	21,319	Marquette	27,684	Superior, Hematite	48,890
Cliffs shaft	64,345	Marquette Ore Co	1,210	Volunteer	18,908
Curry	7,480	Michigamme	12,781	Webster	117
Detroit	1,678	Milwaukee	23,840	Wetmore	5,362
Dexter	2,598	Negaunee	39,008	Winthrop	14,027
East New York	5,759	North Champion	4,925	York	4,629
Grand Rapids	3,635	Pitts. & L. Angeline	111,484		

Total, Marquette Range.....1,150,073

MENOMINEE RANGE.

Armania	20,634	Half & Half	3,592	Monitor	3,956
Chapin	263,182	Hamilton	5,870	Norway	37,333
Commonwealth	43,668	Iron River	68,568	Paint River	9,340
Cyclops	15,440	Ludington	45,786	Perkins	4,705
Dunn	59,923	Mastodon	26,705	Sturgeon River	1,789
Florence	78,114	Mastodon, South	526	Vulcan	69,580
Great Western	16,815	Millie	6,793	Walpole	5,249

Total, Menominee Range.....787,562

GOGEBIC RANGE.

Anvil	16,553	Iron King	11,105	Pence	42,022
Ashland	79,618	Ironton	1,280	Ruby	2,834
Aurora	82,864	Montreal	1,041	Section 33 south	18,076
Beaver	9,839	Norrie	266,548	Sellwood Colby	8,746
Brotherton	32,619	North Montreal	15,020	South Colby	23,584
Cary	19,791	North Section 33	4,822	South 15 Colby	8,215
Germania	45,542	Odanah	2,857	Windsor	7,987
Globe	2,758	Pabst	47,074		
Iron Belt	21,685	Palms	6,964		

Total, Gogebic Range.....777,446

VERMILION RANGE.

Chandler Mine	155,852	Minnesota Iron Co.	250,266	Pioneer	1,047

Total, Vermilion Range.....407,165
Grand Total.....3,121,027
To corresponding date of 1888.....1,699,051

The shipments for the week ending Wednesday, July 24, footed up 236,849 gross tons, against an aggregate of 190,596 tons for the corresponding week in 1888.

The Champion Ore Carrier:—

The Manchester has taken the broom from the Onoko for big load. On July 2 she carried 2,722 gross tons of ore, on a draft of 16.3 forward and 16.5 aft. The Manchester is the best ship that trades to our port. Not the fastest, for she was not built for speed (though she makes 12 miles, easy, and with little regard for weather), but the best for work and wear. Three hundred feet long and forty-two feet beam, she is oak as to bottom and steel top-sides; six, eight and ten-inch oak planking, and five-eighths steel plates. Her boilers are inch steel, licensed to carry 160 pounds pressure, her engine triple compound, and her fittings complete. She is lighted by incandescent electric lamps—137 of them—supplied by an Edison dynamo driven by a Westinghouse engine. Her officers and men are as comfortably quartered as men need be, cared for as well as they could be at a hotel ashore. Capt. Yacks is proud of his ship, and well he may be.—[Iron Port, Escanaba, Mich., July 27.

Iron Discovery in New York:—

It is reported that a valuable bed of iron ore has been discovered in New York, on the Oscar Satterlee farm, on the west branch of the Neversink, 12 miles from the Ulster & Delaware Railroad, at Big Indian. The vein of ore is only 20 feet below the surface, and will run at least 20 feet thick. The ore has been tested, and runs about 65 per cent. in metallic iron. New York capitalists have visited the spot, and, if on future investigation the bed of ore is found to cover a sufficient extent of territory to operate a mine, it is probable that a branch track to the Ulster & Delaware Railroad will be built to ship the ore to Kingston, where plenty of coal and limestone can be had for smelting purposes.

FOREIGN journals continue to commend the advantages of electrolytically deposited copper pipes, as turned out by the Elmore process. Of the time required in this method of manufacture very little information has thus far been given. *L' Electricien*, in a recent issue, states that it took 170 hours to turn out a pipe 0.2 of an inch thick, but nothing is said of the diameter and length, the latter depending upon the length of the mandrel employed. It may not be amiss to repeat here that a claim of 50 per cent. increased strength over ordinary copper pipe is made for the newer product.

TRANS-ATLANTIC CABLE ROUTES.

ELECTRICAL WORLD.

Considerable discussion is now going on in Atlantic cable circles respecting the proposed Canada Atlantic cable, which it is proposed to carry through the Straits of Belle Isle, thus avoiding proximity to cables already laid, and offering a shorter route.

The accompanying table shows the relative lengths and approximate positions of trans-Atlantic cables in present operation; also, the proposed Canada Atlantic cable:

THE ANGLO-AMERICAN COMPANY'S CABLES.

Laid.	Between.	Nautical miles.	
1873.	Ireland and Newfoundland	1,881	
"	Newfoundland via St. Pierre and Cape Breton	293	
			2,174
1874.	Ireland and Newfoundland	1,840	
1873.	Newfoundland and Sidney, C. B.	343	
			2,183
1880.	Ireland and Newfoundland	1,886	
"	Newfoundland via St. Pierre and Cape Breton	360	
			2,246
1869.	France and St. Pierre	2,648	
"	St. Pierre and Massachusetts, U. S.	759	
			3,407

THE DIRECT UNITED STATES COMPANY'S CABLES.

1874.	Ireland and Nova Scotia	2,423	
"	Nova Scotia and New Hampshire, U. S.	560	
			2,983

COMPAGNIE FRANCAISE DE PARIS A NEW YORK.

1879.	France and St. Pierre	2,242	
"	St. Pierre and Cape Breton	188	
"	St. Pierre and Massachusetts, U. S.	827	
			3,257

THE WESTERN UNION COMPANY'S CABLES.

1881.	England and Nova Scotia	2,531
1882.	England and Nova Scotia	2,576

THE COMMERCIAL COMPANY'S CABLES.

1884.	Ireland and Nova Scotia	2,350	
"	Nova Scotia and New York, U. S.	841	
			3,191

THE CANADA ATLANTIC COMPANY'S CABLE (PROPOSED).

1890.	Ireland to Straits of Belle Isle, Can	1,900

The representative expenditure or share capital of the foregoing companies is approximately as follows:

Anglo-American	$35,000,000	Each	line	$8,750,000
Direct United States	6,400,000	"	"	6,400,000
Compagnie Francaise	8,400,000	"	"	8,400,000
Western Union	14,000,000	"	"	7,000,000
Commercial	8,000,000	"	"	4,000,000
Canada Atlantic	1,600,000	"	"	1,600.000

In commenting on the proposed cable the *Dominion Illustrated* estimates that the profitably serviceable continuity of the foregoing cables will be twenty years for the older and twenty-five for the later types, last year's costly experience in repairing the Anglo-American French cable of 1869 being cited as confirmatory of the former calculation.

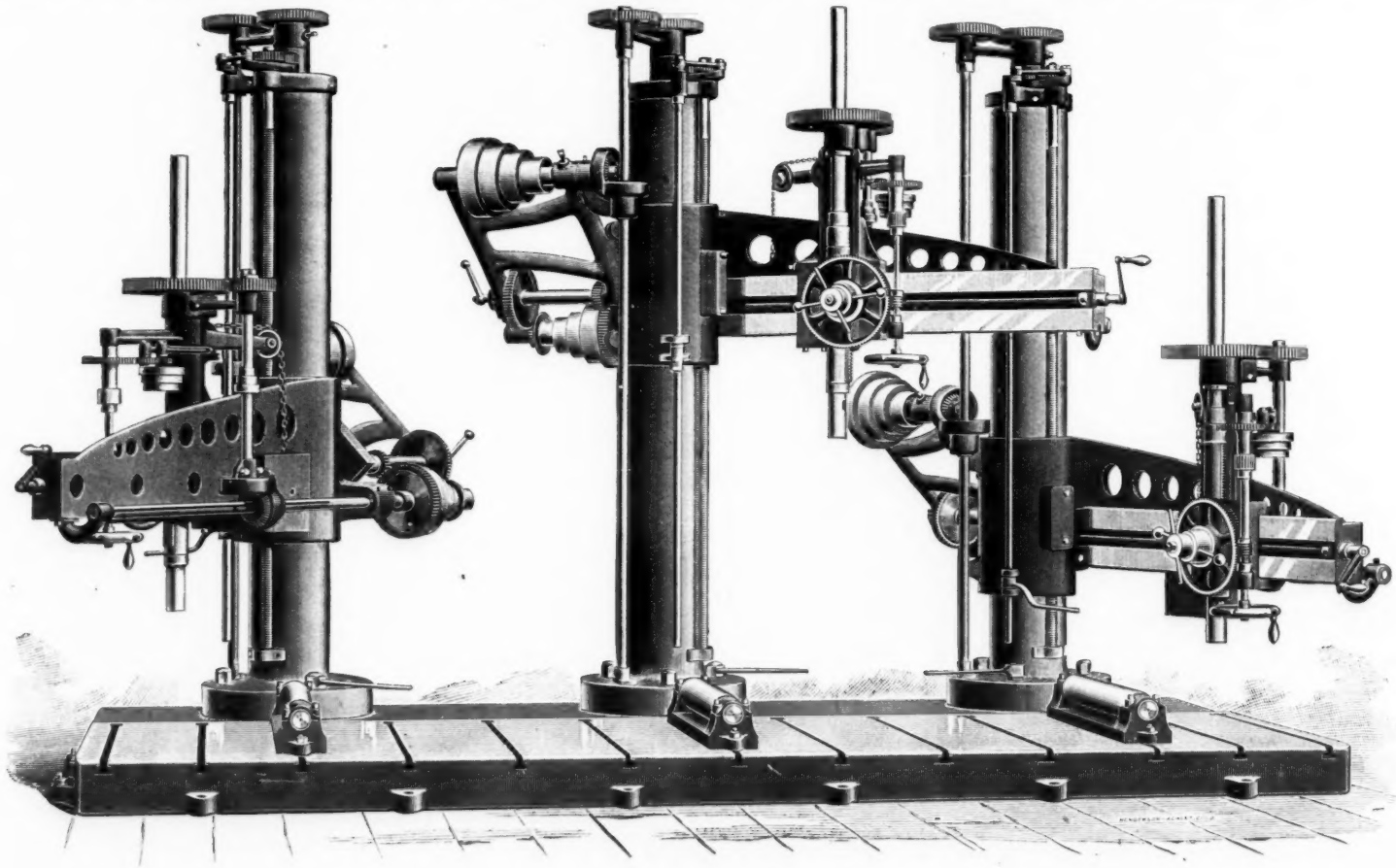
One decided advantage claimed for the new cable is that the Belle Isle route will be over 150 miles northward of a trans-Atlantic cable now laid, and the depth of ocean will be considerably less; it will thus be free from all risks during the repairs of other cables, and can be more readily raised when required. Besides this, the company will only have to provide and maintain the main cable or cables, of not exceeding 1,900 miles in length, the connection eastward being with the Canadian Government Post-Office telegraph service, and westward with the Canadian Government telegraph service at Greenly Island, in the Straits of Belle Isle. Hence, the company will be at no outlay of capital for terminal cables, and no pooling pressure, etc., is practicable. The capital expenditure of the company will, it is estimated, not exceed $2,600,000, one of the principal cable manufacturing companies in London having tendered to provide, lay and guarantee a cable of the most approved type for the sum of $1,500,000, thus reducing the cost much below that of the cables already laid.

RADIAL DRILLS FOR PLATE WORK.

With this we present an illustration showing an arrangement of radial drills specially adapted to heavy plate work, this machine having been built by the Universal Drill Co., Cincinnati, O., for the Portsmouth, Va., Navy Yard. The drills are attached to the heavy bed-plate by means of rigidly attached stumps over which the columns fit, and are so placed that any part of a sheet may be reached by one or more spindles, and all three may be in operation simultaneously.

The rollers, one of which is shown in front of each column, are intended to facilitate the handling of heavy sheets or beams, and may be placed in any desired position on the bed, or readily removed altogether.

Separate countershafts are furnished for each machine, so that the movements of each are entirely independent of the others. Though intended primarily for plate work, it is obvious that the arrangement may be used for other forms of heavy work where it is desirable to drill several holes simultaneously.



RADIAL DRILLS FOR PLATE WORK.

Activity in Electrical Circles.

It is a question whether all the electrical supply houses fully appreciate what a banner year 1889 is going to be for their business. Already contracts have been closed for the installation of electric plants that will require a total amount of supplies far exceeding the aggregate of any previous six months, and the prospective plants for which bids have already been made, tendered or will shortly be called for, and which will certainly be in operation before the new year, will make the total amount of material required and used run up the figures that will surprise every manufacturer and supply man. Already there is complaint of the immediate scarcity of select poles suitable for erection on residence streets, the numerous installations having used up the stock originally carried in the pole yard, and in consequence prices have risen slightly. There are plenty of good poles cut and piled in the forest, but the delay required in obtaining cars and shipping causes annoyance when the time specified in a contract is limited. Oak pins are being turned out as fast as possible, and a large stock of insulators has been secured, but it is probable that contractors will experience some delry in securing shipments before the year ends. There has been a scarcity of certain sizes of copper wire every Fall during the last four years, and this year will prove no exception. This great demand not only effects the manufacturers and dealers in line construction material, but has also increased the activity among the makers of steam plants and all thereto pertaining, as the older lightning plants are rapidly extending their circuits, and requiring in certain cases several hundred horse power extra per plant; the smaller towns of 1,500 or 2,000 inhabitants are demanding electric lights; in the larger cities extensive electric motive power plants are being constructed, and in many cities of all sizes the street railway companies are rapidly adopting an electric motor system.—[Electrical World.

THE enlargement in Russia's trade in cereals is next to America's in its remarkable rapidity.

INDUSTRIAL SUMMARY.

New Enterprises :—

There are rumors of an extensive new steel plant in Cleveland.

A machine shop 40x55 feet is being erected at New Cumberland, W. Va., by Shetter & Co.

A company has been organized at Athens, Ga., by Thomas Bailey, to build a foundry and machine shop.

The Portsmouth (O.) Stove & Range Co., of Portsmouth, has been organized, and is advertising for bids upon buildings and machinery.

Gordon, Stroebel & Laureau, Limited, of Philadelphia, have closed a contract for two 16x60 feet Gorden-Whitwell-Cowper fire-brick hot-blast stoves to be erected at Trondale Furnace, W. Va.

Recent Ohio incorporations: The H. K. House Manufacturing Co., Kent, Portage county, capital stock, $15,000; the Glassboro Novelty Glass Co., Toledo, capital stock, $60,000; the Star Drilling Machine Co., Akron, capital stock, $50,000; the Whitney Electric Manufacturing Co., Columbus, capital stock, $50,000.

Bessemer, Ala., has captured the Henderson Steel plant, and work has been begun on the chosen site. G. W. Gogin and E. C. Robinson, prominent and experienced steel men from Boston, are superintending the construction of the plant. The products will be principally soft tank-plate and basic open-hearth steel, but tack-plate and horseshoe-nail-plate will also be made.

East Dubuque, Ia., is to have a new manufacturing establishment known as the Dubuque Radiator & Iron Co., with George G. Ferguson, president, and Charles Hooper, secretary. It has a capital stock of $50,000, and will employ thirty men. The company will occupy the old Burt factory. They will put in two sixty-horse power engines. They will manufacture steam radiators, water pipe and other metal goods.

Keasler & Vicker are reported by the Chattanooga *Tradesman* to be building a small pig iron furnace at Hughes Springs, near Jefferson, Tex. It will be completed in about four weeks, and will have a capacity of about 5 tons a day. Although small, if it proves profitable, it will immediately be enlarged. In connection with the furnace, the proprietors are erecting a foundry for the purpose of manufacturing plows, etc.

Recent Chicago incorporations: Chicago Brass & Specialty Manufacturing Co., to manufacture brass machinery, capital, $5,000; incorporators, August Hahl, Emil A. Pauli and Henry R. Baldwin.—Union Machine & Blacksmithing Co., to manufacture forgings, capital, $20,000; incorporators, Ernst L. Enning, Charlotte Godey and Charles W. Dunfee.—Chicago Hot Water Boiler Co., to heat buildings and manufacture fixtures, capital, $250,000; incorporators, Elijah J. Devens, S. M. Elvin Crane, Benjamin F. Richolson and William J. Bowerman.

The Reliance Steel Casting Co., which was organized last month by some Pittsburgh gentlemen, is erecting a building 50x125 feet at Thirty-sixth street and Allegheny Valley Railroad, for the manufacture of small steel castings. Mr. Charles Bailey, who was for ten years connected with the Pittsburgh Steel Casting Co., being at the time he left assistant to Superintendent Hainsworth, is chairman of the new company. They will start with a 30-pot crucible furnace, and their aim is to manufacture small castings promptly. The works will be in operation inside of a month.—[American Manufacturer, Pittsburgh.

The Norton Fluid Metal Rolling Co., 46 River street, Chicago, has been organized to own and operate patents taken out by Edwin Norton, covering a novel process for rolling sheet metals in the fluid state. The mechanism consists essentially of two hollow rolls, mounted on a framework, and having interior water connections, the rolls being geared to revolve at an equal or greater speed than that of the wide, flat stream of molten metal, which is continuously poured between them from a secondary reservoir connected with a cupola, and placed directly above the rolls. The molten metal, not being allowed to dam up, is compressed and set by momentary contact at the meeting line of the rolls. The rolls at a speed of about 400 feet per minute, and the solid sheet, planished on both sides, is produced at the same rate of speed. Auxiliary patents have since been taken out, adapting the process to the production of rails and shapes.

Enlargements, Additions, Removals, etc.:—

At Greensboro, N. C., the Eagle Foundry & Machine Shops will erect new and larger buildings.

Mr. H. A. Losier, of Cleveland, has bought the Jewell Manufacturing Co.'s plant, at Toledo, for a bicycle factory. Efforts may be made to secure its removal to Cleveland.

The work of dismantling the rolling mill plant of the Ohio Valley Iron Co., at Moundsville, W. Va., prior to its removal and re-erection at Iron Gate, Va., has already commenced.

The Ewald Iron Co., of Louisville, Ky., have increased the capacity of their works by adding facilities for rolling open-hearth and other soft steel plates, to meet the growing demand for plates of steel.

The Foos Manufacturing Co., of Springfield, O., owning five acres of ground in East Springfield, on the line of the Ohio Southern Railroad, have decided to remove their present plant into a new building, which is now in course of erection. The new structure will be of brick, four stories in height, 230 feet long by 60 feet wide, and is to be completed by November 1. A warehouse and foundry will also be erected.

Messrs. F. E. Myers & Bro., manufacturers of force and lift pumps, hay-carriers, hay-forks, etc., at Ashland, O., have completed their new works, and now have a large and conveniently arranged plant. They have recently put in Teetor's milling machines, and are confident they have one of the best-equipped works in the country for the line of goods which they manufacture.

Recent Notable Contracts:—

The Pennsylvania Construction Co., of Pittsburgh, received a contract Wednesday, from the Rand-McNally building, in Chicago, for 2,500 tons of structural iron, which is to cost $160,000.

The Baldwin Locomotive Works, of Dunkirk, are building 90 new engines, for the Pennsylvania Co., to be used on the lines west of Pittsburgh.

The contract for the steel tubes for the United States steel cruiser Maine which is the largest armored vessel now being built by the Government, has been awarded to the Tyler Steel Tube Co., of Boston. The contract calls for about 50,000 feet of steel tubing.

The Blakeslee Mfg. Co., Du Quoin, Ill., last month, placed one of their No. 6 A steam-pumps in a mine at Roanoke, Ill. The suction-pipe is 800 feet long; steam-pipe, 700 feet long; discharge pipe, 650 feet, with an elevation of about 500 feet. The pump works without shock or jar.

The Pittsburgh Locomotive Works, of Allegheny, are now engaged on an order for 25 locomotives for the Baltimore & Ohio Railroad Co. They are to be eight-wheelers, and will be used on the Trans-Ohio division. As each locomotive will cost $7,000, the total amount of the order will be $175,000.

The American Tube & Iron Co., of Middletown, Pa., and Youngstown, O., have been awarded the lion's share of the Toledo pipe line. The company were awarded such a favorable share of the contract, on account of the merits of their patent joint for natural-gas lines, which is known as Matheson joint.

The Smith Bridge Co., of Toledo, has been awarded the contract for building the bridge at Chattanooga, Tenn. Neely, Smith & Co., of Chattanooga, were awarded the contract for the substructures. The contract for the superstructure was let at $122,361, and for the substructure at $96,198. The bridge will be 2,370 feet long, and will be 100 feet above low water mark, obviating the necessity for a draw.

The Cleveland City Forge & Iron Co. is now engaged in preparing for the Mare Island Navy Yard, at San Francisco, immense plate bending rolls, which are the greatest of their kind ever constructed. These rolls are 31 feet long and 36 inches in diameter and weigh a little under fifty tons. The steam crane required to properly handle the work is of 110 tons capacity, and the hammer used is the most powerful of its kind in the country.

General Industrial Notes :—

Robert L. Walker, receiver, Youngstown, has leased the Himrod furnace for a term of years to S. Frank Eagle, lately with the Cherry Valley Iron Co., at Leetonia. Repairs will be made and the furnace put in operation within thirty days.

The Westinghouse Machine Co., of Pittsburgh, Pa., report that their business is unusually active for this season of the year. The orders received by them for the first twenty days of July, amount to 48 engines, footing up to over 3,000 H. P.

The Globe Iron Works, Cleveland, have the contract for the first four ships for the Minnesota Iron Co. The contract price is $800,000, or $80,000 less than was at first supposed would be the cost. They must all be completed within the year, or by July 1, 1890. The same ship-yard will turn out two additional boats for the Lehigh Valley Transportation Co., to cost $250,000 each.

The property of the Nashville Iron, Steel & Charcoal Co., in West Nashville, Tenn., has been sold by R. L. Morris, assignee. The Nashville Furnace Co. have already been organized to operate the works. The sale was made subject to all liens, amounting in the aggregate to $180,000. It was finally knocked off to the Buttorff syndicate at $11,000, plus the prior liens. The incorporators are J. Ellis, H. W. Buttorff, W. M. Pollard, J. H. Moore and J. M. Head.

John Birkinbine, the noted engineer of iron and steel works, arrived in Duluth this afternoon, in response to a message from Secretary Stowell, of the Duluth Iron & Steel Co. "On my way West," said Mr. Birkinbine, "stopped at Lebanon, where they have built the big engine for the works. It was being taken down for shipment, and now part of it is on the road. All machinery is either on the way or completed ready to ship at the earliest moment."—[Duluth (Minn.) Herald, July 24.

The Bookwalter Steel & Iron Co., 18 Cortlandt street, New York, owners of the Robert process for the manufacture of steel, have been advised that their exhibit in the Paris Exposition was awarded the highest gold medal and 14,000 francs. John Brown & Co., of Sheffield, have taken a license from the English company controlling the patents for that country, and are setting up a plant. The Michigan Steel Works, at Detroit, are now in operation under this process, and are said to be meeting with success.

The Westinghouse Machine Co. seem to have solved the problem of medium and small-sized compound engines, in addition to the heavier horse-powers. This company is now manufacturing single-acting compound engines down to 35 H. P., and adding a line of patterns down to 3 H. P. Although turning out over 3,000 H. P. per month, they are constantly oversold, and are now running their works on double turn. To illustrate the adaptation of the compound engine to small powers, we would note one of their compound condensing engines of 45 H. P. on the dock of the Red Star Steamer Co., at New York. This engine exhausts into a Korting condenser, using salt water, and operates a storage battery plant.

A Natural Gas Trust.

A dispatch from Lima, O., July 21, says: There is a movement on foot, looking to the consolidation of all the natural gas companies in the Ohio and Indiana fields and put them into a trust. Dr. S. A. Baxter, of this city, is quietly engineering the matter, with the aid of J. B. Townsend, H. M. Ernst and others. It is understood that the arrangement has the sanction of Calvin S. Brice, Oliver H. Payne and other Standard magnates. They now own the majority of the stock of the companies in Ohio and Indiana, and will buy up the stock of the remaining independent companies. It is a gigantic scheme which will likely mature in a few weeks.

THE NEW BRUSH ALTERNATING CURRENT SYSTEM.

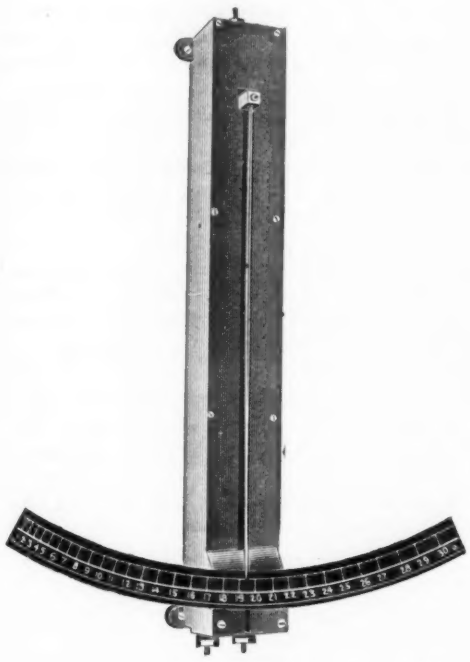


FIG. 10.

FIG. 4.

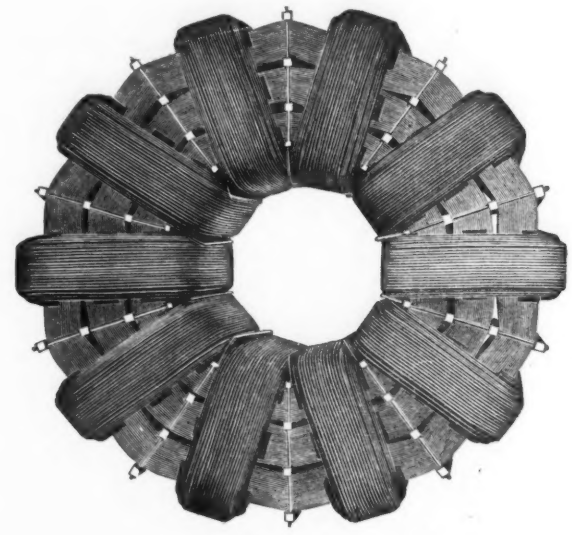


FIG. 7.

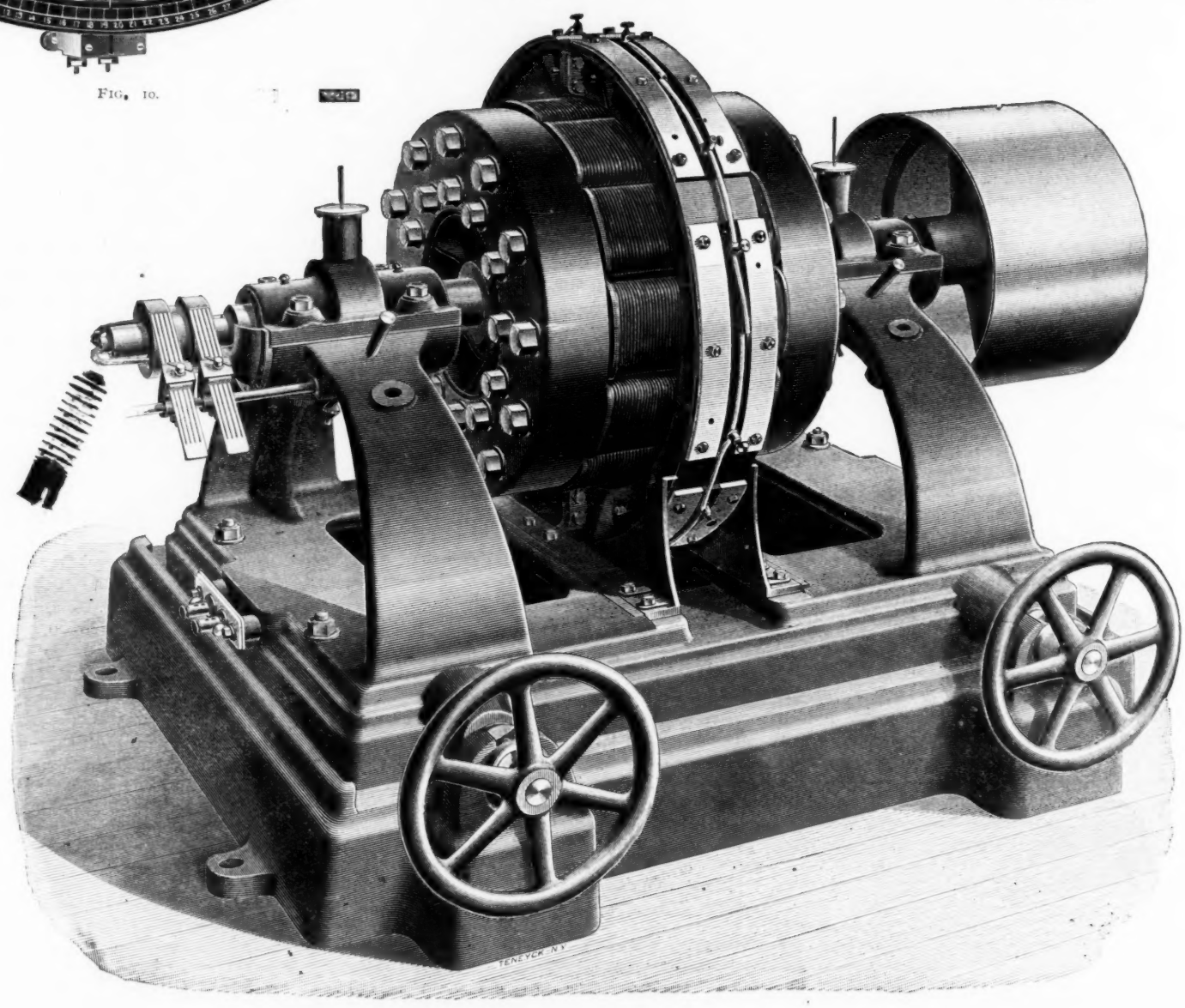


FIG. 1—ALTERNATING CURRENT DYNAMO ELECTRIC MACHINE.

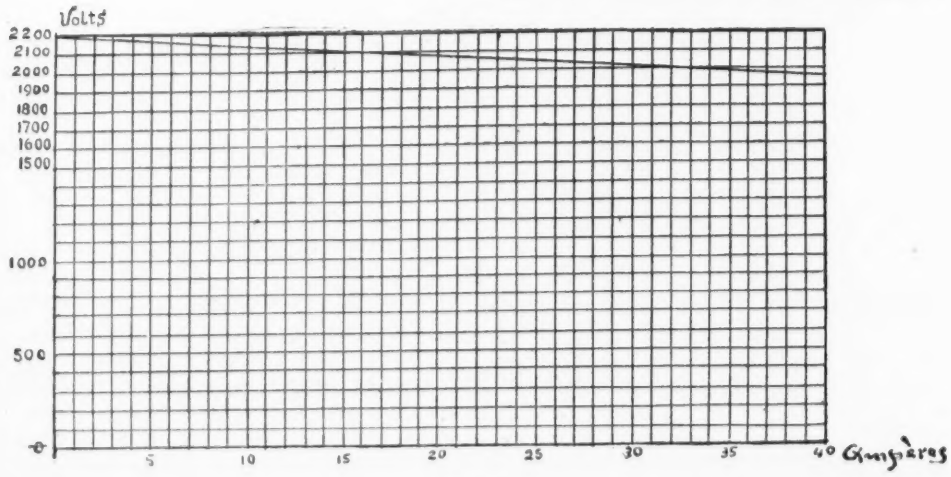


FIG. 5.

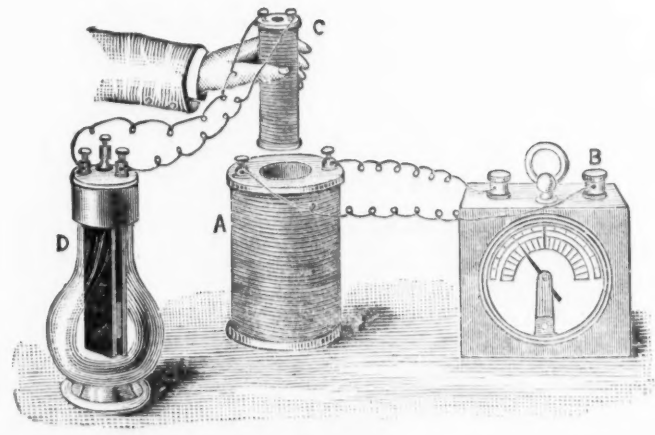


FIG. 6.

THE NEW BRUSH ALTERNATING CURRENT SYSTEM.

The system of long distance transmission of electrical energy which we illustrate herewith, is characterized in a high degree by efficiency and simplicity. The end attained has been reached by a bold abandonment of the long-traversed routes already familiar to the public. The underlying principle of the remarkable "Coreless" dynamo, here illustrated, was discovered and applied by Mr. Brush, more than 10 years ago, and new demands have now called for its extended application on a regular scale.

The first glance at the dynamo (Fig. 1) shows that it is novel, compact, simple, symmetrical and strong. A brief examination shows that it is of the alternating type; that its field magnets are many, and carried by the shaft; that the armature is fixed and absolutely free from any magnetic material; that its parts are easily accessible, and that an armature coil may be cut out, removed or replaced without stopping the machine.

The machine chosen for illustration and description has an output of 60,000 watts; it supplies current for a thousand 16 candle-power lamps.

The shaft bearings, bearing standards, base plate and armature slides are cast in one solid piece. The center line of the shaft is 16 and $\frac{11}{16}$th inches above the surface of the base plate, high enough for access to all parts of the dynamo and low enough for steadiness, and freedom from strain on foundations. The 4-inch steel shaft (tapering to 3½ inches in the bearings) carries two heavy cast iron yoke pieces, 27 inches in diameter. To each of these are screwed, at equal radial and circumferential distances, the wrought iron cores of 12 magnets of alternating polarity. The two yokes pieces, with their bolts, washers, etc., weigh about 950 pounds; the magnet cores, 308; the magnet wire, 400. Thus the whole rotating mass of cast iron, wrought iron and copper, acts as a fly-wheel weighing more than 1,700 pounds, and tending to neutralize any variation in the speed of the prime generator. As the nominal speed of the machine is fewer than 1,000 revolutions per minute, the structural strength is more than sufficient to meet all demands made by centrifugal force. Further than this, the mechanical stress is less when the magnets are excited than when the alternator is running without load, as the lines of magnetic force between the faces of opposing poles, tend to counteract centrifugal force. In machines of larger size, as usual, the speed is less, that of the 150,000-watt dynamo being not more than 700 revolutions per minute. This larger alternator is driven by two belts and carries a pulley at each end of its shaft. The great advantage of low shaft speed will be appreciated by every mechanic who has a due regard for depreciation of apparatus and cost of oil, attendance, trouble and repairs.

The pulley has a 14-inch face. As it overhangs, the belt may be run to countershafting overhead or below. The shaft bearing at the pulley end has 14 inches wearing surface, and the bearing at the other end 12 inches.

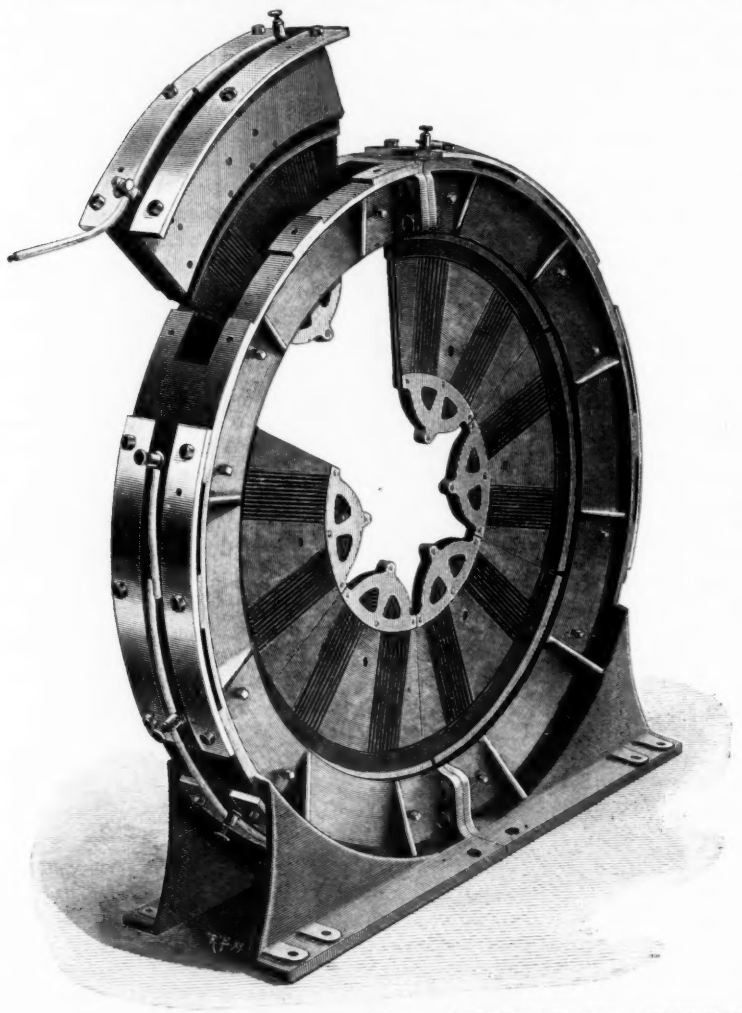
But the most interesting part of the alternator is the fixed armature, shown in Fig. 2. The vertical disc is occupied by flat armature coils, made of insulated copper ribbon wound on porcelain cores. The copper ribbon of each coil is reinforced on either side with strong insulating material of the same thickness as the porcelain. One of these reinforcements is grooved and the other tongued. The coil, consisting thus of core, ribbon and reinforcements, has an angular width of 60 degrees. The upper part of each face of each coil is covered with an insulating plate $\frac{5}{16}$ of an inch thick. The coil thus built up and insulated is set in German silver holders, cut from true turned rings and held together by sunk-headed screws, as shown in Fig. 2. Each terminal of the copper ribbon connects with a binding post as shown.

The six armature coils thus mounted are carried in a German silver frame consisting of two semi-circles bolted together on the line of the vertical diameter. The cross-section of this ring frame is girder-like. Into the slots of the frame slip the six mounted armature coils, the tongue on the edge of the one engaging with the groove on the edge of the next. The coils thus thrust into the intense magnetic field constitute a disc $\frac{9}{16}$ of an inch in thickness, and with an opening in the centre through which passes the revolving shaft. As there is no magnetic metal in the armature, there are no local currents to waste the energy.

The several coils are insulated carefully, and the stationary armature, as a whole, is insulated from the bed plate on which it rests. The coils are joined in series, the binding posts adjacent to any radial line of division between the two coils constituting fixed terminals for the main line. There is no commutator; there are no collecting brushes to take the alternating current from rotating parts.

The low resistance of the armature coils is evident. It would seem impossible for one of them to burn out; none ever has burned out. But if one should, it may be removed and a new one readily put in its place in three minutes, or the injured coil may be shunted out of the circuit, and the dynamo kept running with the other five until the time for shutting down. The coil section complete weighs only about 20 pounds.

The whole armature may be removed by loosening the coupling bolts and sliding each half of the frame with its three coils from between the field magnets (Fig. 3). As each half with its coils weighs only about 100 pounds, no time need be wasted on cranes or blocks, and in a few minutes the armature may be back in position.



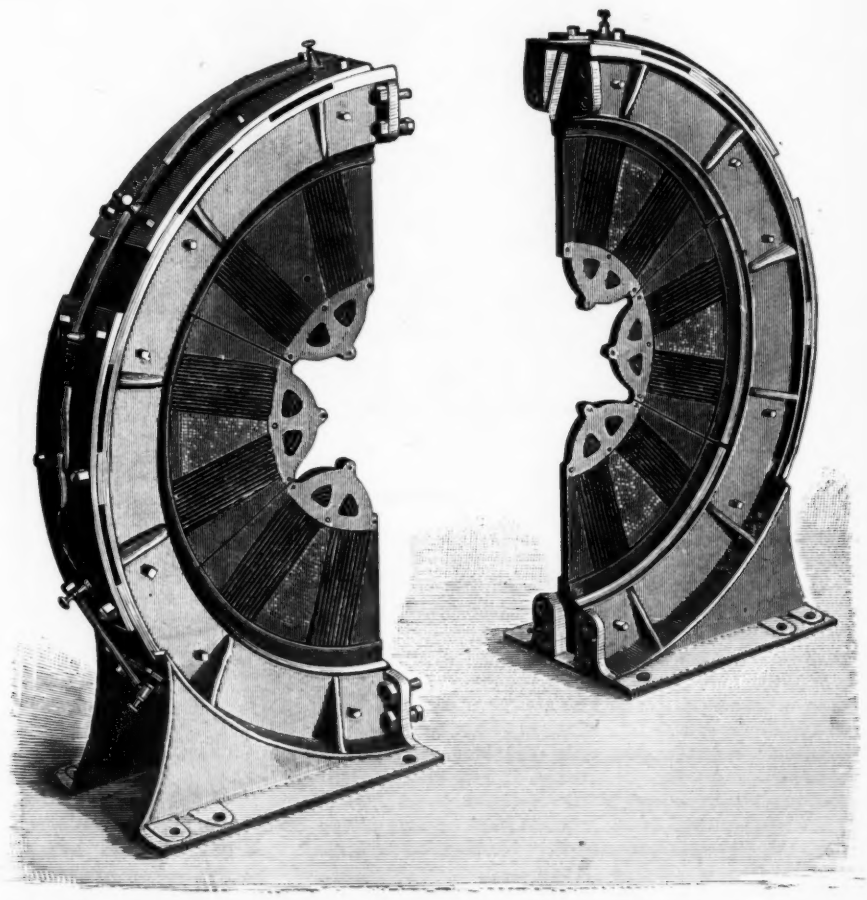


FIG. 2.—ARMATURE FOR ALTERNATING CURRENT DYNAMO ELECTRIC MACHINE.—FIG. 3.

In action, the 24 field magnets of the alternator are excited by the direct current from an 11-inch Brush dynamo of the well-known form. This exciting current is carried to the brushes that rest upon the two uncut insulating rings (shown at the left of Fig. 1), and thence through the hollow shaft to the magnets. A rheostat (Fig. 4), worked by hand or automatically, is placed in the shunt circuit around the field magnets of the exciter, so that perfect regulation is secured without readjustment of the brushes or any necessity of handling the high tension alternating current.

The Brush-Pfannkuche "coreless" alternator is built at present for an E. M. F. of 2,000 volts, although it would be easy to develop a difference of potential much greater. It is confidently expected that the necessity of long distance transmission, with a line of moderate cost, will soon call for currents of higher tension. Economy of power as well as economy of copper points in this direction.

We here find a potential curve that varies little from a horizontal line. The fall of potential in the machine from no load is less than 10 per cent., as is shown in Fig. 5, which represents a diagram taken from one of the first machines. All this without compound winding of any kind, a result, it is claimed, that has not been approached by any alternator with an iron core in its armature. All of the regulation needed is applied at the exciter as already described.

This results in a more even distribution of potential in the feeders and at

the converter terminals, and a more even pressure at the terminals of the lamps beyond.

For the information of those not yet familiar with the modern alternating current system of distribution, we may state that the high tension current of the alternator is well adapted for economical carriage to distant points, but it is not of the kind most desirable for introduction to the household or for the use in the lamp. Having brought electric energy from the place where we wish to develop it to the place where we wish to use it, we may easily change the form given to it for economy of transportation and adapt it fully for the uses to which it is destined. The letter of credit may be exchanged for its equivalent in currency, but the cash box must be larger than the envelope. So in the present case, high tension may be exchanged for greater current, volts for amperes, what we have for what we want; but the conducting wire must be made larger. This transformation is accomplished by the converter, a simple device with purely electrical functions and without moving parts.

The principle underlying the action of the converter is the well-known principle of electrical induction. Imagine two coils of insulated wire, A and C, constituting closed circuits, Fig. 6. Thrust C into the thoroughly insulated core of A. When a current of electricity begins to flow through C, a momentary current will flow through the wire of A, and may be detected by the movement of the needle of the galvanometer, B. The current of A is not the current of C, but it is produced (or induced) by it and exists at its expense. This induced current in A is merely momentary; if the current continues to flow

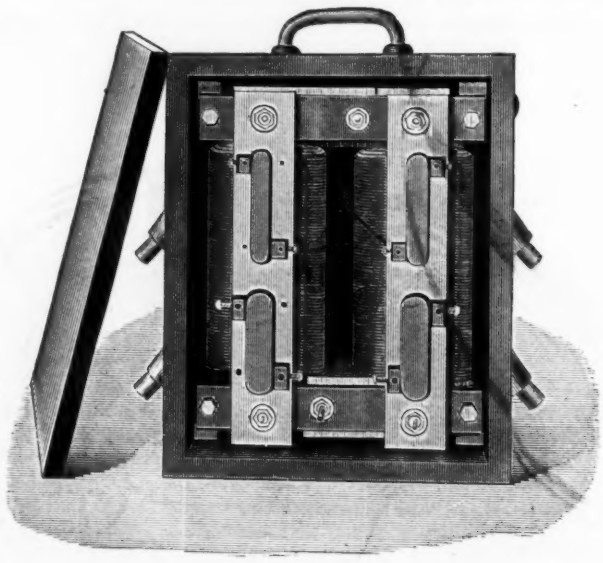


FIG. 8.

FIG. 9.

through C, there is no further electrical disturbance in A; the needle of the galvanometer rests at the zero point. If, however, the current of C is stopped, another current will be induced at A, the two currents thus induced being opposite in direction. Thus a succession of stops and starts of the current of C (the primary) induces a corresponding series of momentary currents in A (the secondary). The relation of the direct and induced currents will be determined by the constitution of the coils, *i. e.*, the size of the wire and the number of convolutions in the coils. Either coil may be exterior to the other or the two may lie side by side. Of course, we are seeking merely to describe not to obtain this inductive action.

There can be no reversal without a stop and start. Consequently, the rapidly alternating current of the dynamo just described is of the character most efficient for the development of induced currents in the secondary coil. The two coils now described constitute a converter. It only remains properly to adjust its parts for the end in view, and to work its effectiveness up to the maximum.

If, as is now well understood, the two coils be made alike, the size and length of the wire, and the number of convolutions being the same, the induced current will resemble the inducing current, as to tension (potential —E. M. F.—volts) and current strength (amperes). If the secondary coil be made of a greater number of turns of finer wire, the current strength will be reduced and the tension correspondingly increased. This is the effect produced in the ordinary induction, or Ruhmkorff, coil. If, on the other hand, the secondary coil be made of fewer turns of larger wire, the tension will be reduced and the current strength increased. This is the end we now desire, and the converter is thus constituted. As in the Ruhmkorff coil and the armature of the ordinary dynamo, the inductive effect is heightened by an ordinary core. In the Brush Co.'s converter, here represented, Fig. 7, the core consists of a polygonal ring made of insulated iron wire of the best quality, so wound as to leave several concentric air spaces in the core. In the converters of the smaller sizes, the core is built up of perforated thin iron plates (Fig. 8). In either case, the iron is so divided that the efficiency of the converter is little less with half than with full load.

Upon each side of this core, or iron ring, is wound a single layer of heavy copper wire. The four or five single layer coils carried by each half of the core are joined in series, and the two groups, borne by the two halves of the core, are joined in multiple, the whole constituting the secondary coil. The terminals of this secondary coil connect with the secondary main line running into houses and supplying current for the lamps. Most of the converters are wound so as to give a secondary current of about 100 volts, but may instantly be connected to give 50 volts and twice as many amperes as before. They are made in sizes that supply each from five to 250 sixteen candle-power lamps or more.

Between the fine iron wire of the core and the heavy copper wire of the superposed secondary coil, insulating pads, one-eighth of an inch thick, are placed at the corners of the core. Between these insulating corner pieces are insulating air spaces. Thus, the copper and the iron are separated from each other at the corners of the core by their respective coverings and the insulating pads, and at all other points by their respective coverings and open air spaces, the latter affording ample ventilation and facility of examination.

Over each of these single layer parts of the secondary coil are bound a few layers of smaller copper wire to form a corresponding part of the primary coil. These corresponding parts of the secondary and primary coils are separated from each other by insulating pads at the corners and intervening air spaces in the same manner and with the same advantages as previously described (Figure 7.)

Nothing could be more satisfactory than the ventilation of these converters. The insulation resistance is exceedingly high. It is impossible so to overload the wire of the primary circuit as to force its current into the secondary circuit. In other words, the high tension current cannot pass the converter. The converters are tested at the factory with double load and no one has ever given out. Yet, to make safety doubly sure, overloading is made impossible by the use of safety fuses for the primary coils. These are extra long, so mounted on slate or porcelain strips that they can be removed or replaced with the fingers merely, and without touching any metallic part of the converter.

The converter coils, with safety fuses, etc., are placed in wind and weather proof cast iron boxes of pleasing design (Figures 8 and 9), and may be placed wherever most convenient, the governing principle being to do as much work as possible with the less expensive primary wire, and to shorten the more costly secondary main. Thus, the converter, as the local centre of distribution, is brought near the lamps it is to feed, and placed on the nearest line pole or on the wall of the building.

The Brush Co.'s converters are now made of the following sizes: No. 1, which feeds two lamps; No. 2, which feeds five lamps; No. 3, which feeds ten lamps; No. 4, which feeds 20 lamps; No. 5, which feeds 30 lamps; No. 6, which feeds 40 lamps; No. 7, which feeds 50 lamps; No. 8, which feeds 75 lamps; No. 9, which feeds 100 lamps; No. 10, which feeds 150 lamps; No. 11, which feeds 250 lamps. Other sizes can be easily made as desired.

With converters as with dynamos, the larger sizes are the most economical. With a 100-volt converter fed by a 2,000-volt primary current, it is more easy and profitable to run a short secondary main to supply several consumers than to provide a converter for each consumer. Of course, the latter may be done if, for any reason, it seems desirable. But the Brush Co. prefer, when practicable, touse large converters supplyin gseveral consumption circuits. On the other hand, the Brush Electric Co. claims that even its 98 per cent. of efficiency is exceeded in the larger sizes, and points out the additional important fact that, as they are made of heavier wire in both primary and secondary coils, they are practically indestructible. There is no longer any need of placing a group of converters to feed a secondary main, or of furnishing a separate converter for each consumer.

Fig. 9 represents the ammeter, a device placed in the main or feed circuit, wherever it is desirable to measure the strength of the current. It is a compensated expansion device, (acting on the principle of the lamp covered by Mr. Brush's patent, No. 219,209, Sept., 1879). Free from any magnetic action, the simple compensating arrangement insures the normal working of the apparatus at all temperatures. It is equally efficient with direct and with alternating currents.

The alternating current apparatus of the Brush Electric Co. here described, is based on the patents of Charles F. Brush and Gustav Pfannkuche, the latter having the supervision of this branch of the Brush Electric Co.'s business. Large orders for this apparatus have already been taken and its commercial success is fully assured.

The Larger "Trusts."

The trust companies, whose unlisted securities are dealt in at the New York Stock Exchange, have given their capital stocks and issues of certificates as follows:

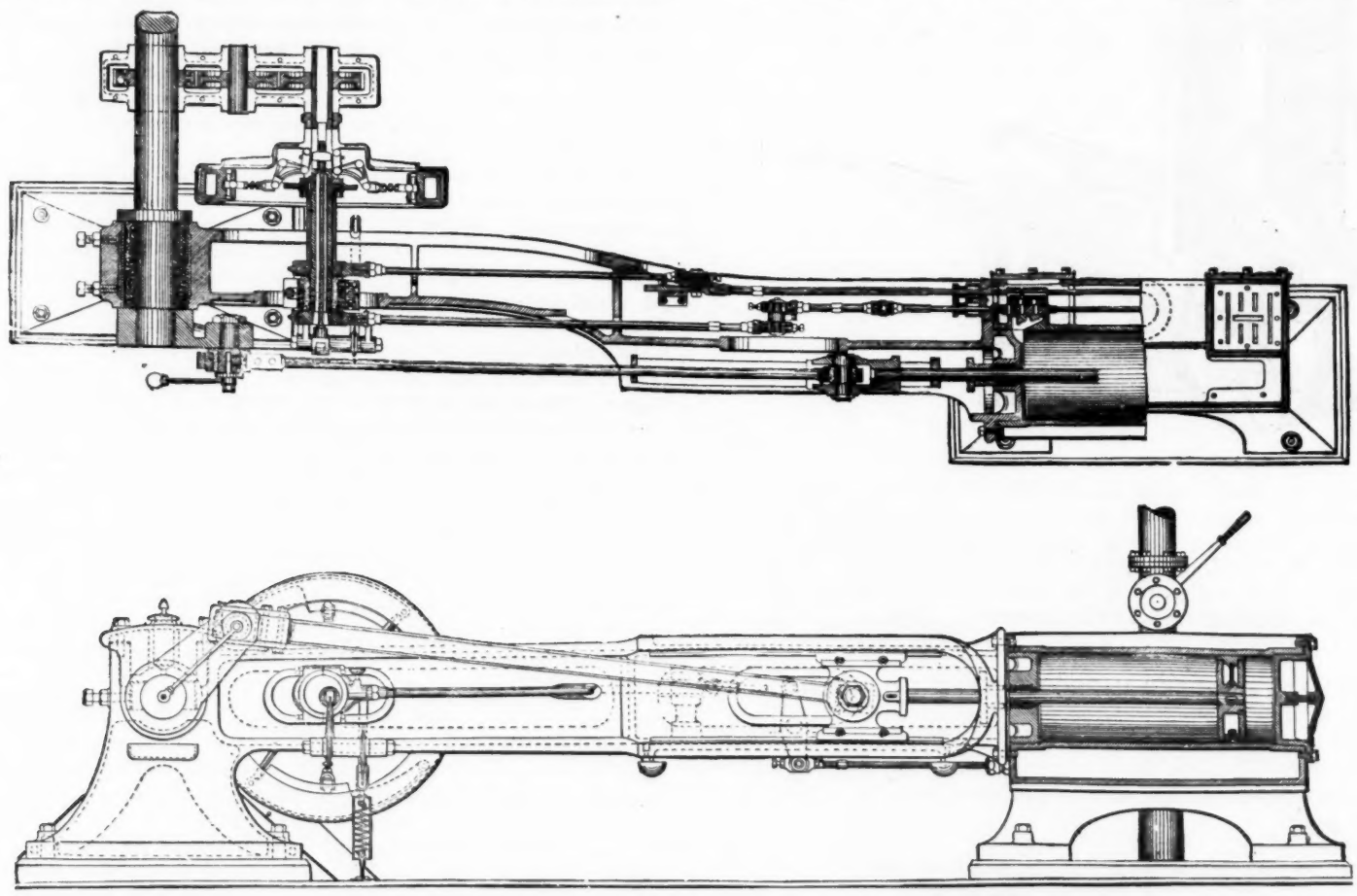
Name of Trust.	No. Certificates.	Total Capital.
Lead	830,188	$83,018,800
Sugar	498,565	49,856,500
Cotton Oil	421,852	42,185,200
Distillers' and Cattle Feeders'	307,266	30,726,600
American Cattle	133,961	13,566,100
Totals	2,191,822	$219,183,200

The Chairman of the Committee on Unlisted Securities says that, under the rules, the companies whoes share are quoted are not called upon to make any statement to the Stock Exchange other than voluntary.

CLASS C KILBY ENGINE.

Herewith is shown a class C standard engine, manufactured by the Kilby Manufacturing Co., Cleveland, and also a horizontal section, which shows the form of the girder and cylinder, and clearly exhibits the various working parts in their relation to each other. In the elevations there appears a section of the piston and there is shown the form of cross-head, connecting-rod and crank. The horizontal section further details the cross-head, the stub ends of the connecting-rod and the crank. The main bearing with its quarter boxes, shoes and means for adjustment is clearly detailed, and there is shown the train of three gears, which drives the governor shaft from the main shaft; the governor also appears in section, showing the weights, bell cranks and attachments to the thrust-rod. The e evation and plan exhibits the large bell crank, to the vertical arm of which the thrust-rod is attached, while the horizontal arm supports the hanging weights and has attached to it the spiral spring which appears in the elevation. Referring once more to the horizontal section, it will be noticed that the main eccentric is attached directly to the governor shaft, and the cut-off eccentric is attached to a long sleeve, which by suitable connection with the governor weights, is made to rotate the eccentric forward or backward, and thus change the point of cut-off. The main eccentric operates the main valves and also the exhaust valves, through the intervention of a rock arm. The eccentric rods and valve-stems have means for adjustment of length; these with the joints at the rock arm and the slide to prevent vibration of the cut-off valve-stem, as well as the mode for attaching the valves to the valve-stems, are all shown in the horizontal section.

The lower right-hand portion of this section shows that part of the cylinder where the exhaust valve for this end is situated. The piston-rod stuffing box is bushed with brass; the manufacturers use for the piston-rod, and also for the valve-stems, an improved form of metallic packing. In the vertical section appears this company's form of cylinder head, which projects within the cylinder and reduces clearance to as low an amount as possible. The forward head is formed by the end of the girder frame, but in the larger sizes the head is made separate and bolted to the frame. Objections have been made against this deep form of cylinder head, on the ground that the annular space between the head and counterbore affords so much more condensing surface than the ordinary form of cylinder head; but, in point of fact, this objection does not hold at all, because the manufacturers make their cylinder heads a truer fit for an inch or so at the outside bearing, and an easy sliding fit for the rest of the length. The space between the counterbore and head, which is about the thickness of a piece of paper, becomes, when in use, completely filled up with a deposit from the oil used to lubricate the cylinder, which is driven in by the steam, and effectually prevents any condensation from this cause. The various details alluded to in this general description will be found more thoroughly illustrated and described in the company's catalogue, which will be sent on application.



CLASS C KILBY ENGINE—ELEVATION AND HORIZONTAL SECTION.

Electricity, Aluminum and Ballooning.

Many of the great inventions of late years seem to place mankind even nearer the desired success in navigation of the air. The electric motor supplies a power in many respects better adapted to the purpose than any other; in fact, as long as the problem was how to support passengers and a steam engine of sufficient power to give speed, with the necessary fuel, it seemed well-nigh insoluble. The discovery of aluminum, and of economical processes for its production from common clay, is another step toward success, the combined lightness and strength of that metal rendering it peculiarly adapted to the purpose. When it can be produced cheaply, and fashioned into desired forms, the air-ship of the future will not be far away. But it may prove that the world need not wait for further developments. Inventions and ingenious constructions already in existence seem to approach so near the desired result that no one will be much surprised if, almost any day, the "pilots of the purple twilight" should begin to traverse the air.—[New York Tribune.

Russia Sheet Iron Manufacture in Ohio.

Joshua S. Ingalls & Co., of Troy, O., after three years of unceasing experimental work, embodying the Craig process of producing steel sheets that would resemble Russia iron in appearance and quality, announce that they have at last succeeded in passing that stage, and are now producing an extra quality of sheet steel that will readily adapt itself to all purposes for which Russia iron has heretofore been used. A brief description of the process is herewith given.

After the sheets are drawn to gauge, their process, which is protected by several patents, consists of, first, painting the sheets upon both sides with ingredients composed principally of the oxides of the softer metals, which under the subsequent heats form so intimate a mixture with the sheet steel as to give it a pliable and elastic surface, susceptible of a high degree of luster, which is at the same time very tenacious to the main body of the sheets. After heating in furnaces, wherein natural gas is used as a fuel, they are subjected to hard hammering under powerful steam-hammers, producing a brilliant polish. The sheets are then taken to a shear, and their edges trimmed, when they are packed into cases, containing about 250 pounds each, for shipment.

At present, the company manufacture the lighter gauges only, from Nos. 24 to 28 inclusive. The aim of the company is to manufacture an article as nearly like the genuine Russia iron as possible, not only in its color and luster, but also in the other essential qualities, viz.: tenacity of scale, ability to withstand rusting, and holding its color under long-burning heats in actual wear. It is a low-carbon, soft, tough and pliable fabric, capable of being worked into most difficult shapes, and holds its scale remarkably upon bending.

The company occupy an acre of ground, immediately adjoining the Indiana, Bloomington & Western Railroad, and Cincinnati, Hamilton & Dayton Railroad, upon which suitable buildings have been erected covering annealing-furnaces, pickling-vats, steam-hammers, shears, rolls, etc. The present capacity of the mill is from 2 to 3 tons of finished product per day, single turn, depending somewhat on the gauges produced, for which a ready sale is found. The company will, in the near future, build an addition to the present plant to be used as a ware-house, and will add other needed improvements.

THE modern plan of subdividing steam power; in other words, the primary transmission of power from the boiler to the work by means of steam pipes in place of belts and shafting, is rapidly growing in favor. Westinghouse, Church, Kerr & Co. are leaders of this branch of engineering, and are now fitting up the plant of the Long Island Railroad at East New York, using in place of a single engine, three engines of 75, 60 and 25 H. P. respectively.

ENGLAND has a coal canal sixteen miles long, between Worsley and St. Helens, which is underground from end to end. The men lie on the coal and propel with their feet against the roof.

BRICK-YARD SUPPLIES.

D. J. C. Arnold, New London, O., manufacturer of brick-yard supplies, has been established since 1878. His specialties are brick moulds and wheel-barrows. This plant has had a steady growth ever since it was started, so that at the present time it is considered one of the largest of its kind in the country. The daily product of the company is 100 moulds, and the business is increasing each year. Wherever these moulds are used they give the best of satisfaction. They are made from the best material, and are finished up in a superior manner.

Two styles of barrows are herewith shown. Fig. 1 is the No. 1 brick barrow; weight with springs 100 pounds.

This barrow is designed for wheeling green or burned brick, and is intended to carry all that one man can wheel. The load is well balanced

FIG. 2.

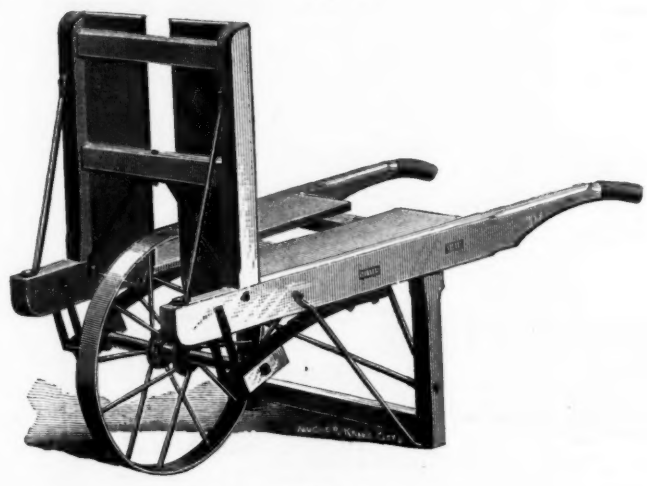
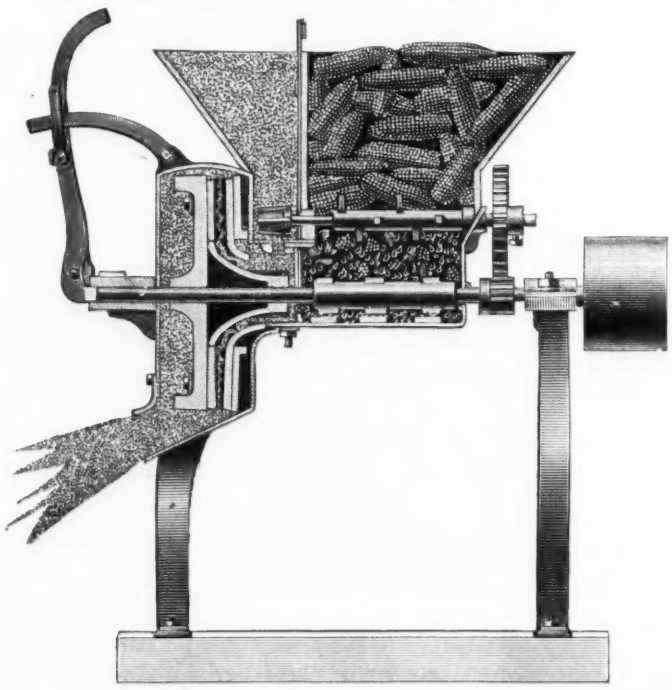


FIG. 1.

over the wheel. The dash is made square with the bottom, which prevents bruised corners, and is high enough for five tiers of green brick. There is a cross-girt between the two legs to rest upon a plank, if desired, but if this is not wanted, it can be sawed out without injury to the barrow. If supplied with springs it is much easier to wheel, and it is also better for the brick. Fig. 2 shows a No. 15 spring truck, which possesses many points of superiority.

THE "ENTERPRISE" IMPROVED FEED CYLINDER.

The accompanying cut, exhibiting the inside working parts of the "Excelsior" improved grinding mills, shows the partition in the hopper, with ear corn on one side, and oats on the other, which may both be ground at the



same time, and in any proportion. This is claimed to be the only mill that will do this successfully with once putting through. The corn is first broken by the upper cob-breaker, from which it falls into the lower cob-breaker on main shaft, which reduces it finer and to a proper size for entering the grinding plates. The lugs on the lower cob-breaker are wedged shaped, tapering toward the grinding plates, thus forcing in the feed, auger fashion, making practically a force-feed. The feeding of ear corn is regulated by a lever and slide, so as to leave the crushed ears in only so fast as desired. This is especially desirable when using the mill with light power, or when wanting to grind other grain with ear corn. The oats feeder is fastened to the end of the same shaft as the upper cob-breaker, and is also regulated by a slide working under it, so as to fully adjust to feed as fast or as slow as may be desired. The oats or any other kind of small grain combine with the crushed ear corn after the corn is reduced to the proper size for plates. This is the only place that the two can properly be mixed, as the manufacturers have found by long experimenting.

The concaves are of new design, and made of especially hard metal, and being reversible, they now fully double the life of plates that are made to run only in one direction. The wearing parts are all made of chilled metal, and the mill throughout of first-class material. By a clamp setting arrangement the mill is so provided that if any hard substance should get into the grinding plates, they will separate and let it through without damage to the mill. The fly-wheel, being inside the casing, is where it is most needed, and out of the way. Manufactured by the Enterprise Manufacturing Co., Columbiana, O.

Diminutive Machinery.

The engine makers, like the watch makers, have tried to attain distinction in the matter of the diminutive. In 1870 John Penn, the eminent maker of great steam engines, who resided at Greenwich, England, came into possession of what was then the smallest steam engine in the world. It stood on a three-penny piece. It really covered less space for its base plate measured only three-eights of an inch by about three-tenths. From the extreme smallness of the model some of the details were omitted, but not enough to interfere in any way with its going. The screws were only one-eightieth of an inch in diameter, and these were duly furnished with hexagonal nuts, which only could be loosened by aid of a tiny wrench made for that purpose. The weight of the whole model, without the threepenny base, was less than the weight of the coin itself.

Six years later, at the time of our Centennial Exhibition, Penn would have felt ashamed of his "threepenny-piece engine" had he had it on Exhibition at Philadelphia. During the progress of this great exposition, Levi Taylor, of Indianola, Ia., placed on exhibition "side by side" with the great Corliss engine, an engine, perfect in all its parts, built on a twenty-five-cent gold piece, and with some of its parts so small as to only be seen by aid of a powerful microscope. The entire engine weighed but three grains. In other words, it would have taken 140 such engines to balance an ounce avoirdupois. Three of the Penn engines would have weighed more than 146 like that made by Taylor. The engine made by D. A. Buck, of Waterbury, Conn., is usually given, in lists of small things, as the smallest engine in the world; but this is a mistake. The one mentioned last above so far takes the palm for smallness. The writer cheerfully admits that the Buck engine is more perfect in its details than the Iowa wonder; but the fact that its base plate is a gold dollar, forever kills its claim to being the smallest, as the Iowa engine, as mentioned above, uses a twenty-five-cent gold piece for the purpose. Buck's engine has 148 distinct pieces of machinery held together by 52 screws. Three drops of water filled the boiler to overflowing. The diameter of its cylinder is one-twenty-eight of an inch; the length of stroke, three-thirty-seconds of an inch; its entire weight, four and a half grains.—[Western Manufacturer.

New Possibilities in Steel Rolling.

A machine invented by a member of a prominent firm in Chicago, and which has been in use for more than a year, is said to turn out a continuous sheet of solder, of any desired width or length, at the rate of 450 feet per minute. The machine consists principally of two hollow revolving cylinders, the space between which represents the thickness of the sheet of metal to be produced. From a convenient reservoir molten metal is conducted through pipes, which are heated by gas-jets, to a nozzle which drops the molten metal between the cylinders. Water pipes connect with the hollow cylinders, making a perfect circulation of cold water through them, and the salient point of the invention is that the molten metal, at the instant it strikes the peripheries of the two cylinders, is chilled and comes out at the bottom of the machine a uniform sheet of metal.

While as yet the machine has only been used in the manufacture of solder, the patentees claim that the principle can be adapted to the making of steel rails, steel sheets for tin-plates, and many other purposes. The length of the sheet or rail made by the machine is only limited by the supply of molten metal.

Five patents have been granted on the new machine in America, and thirty in Europe.

In 1865, Bessemer, the steel manufacturer, secured a patent on a process of pouring melted metal over a cold cylinder or between two cylinders. Bessemer's scheme was a failure, for the reason that his cylinders did not revolve fast enough, and the metal chilled above the rolls, forming a wedge, that simply went through the machine in the form of cold rolled steel. This difficulty is overcome in the machine described, by making the speed of the two cylinders equal to the speed of the stream of molten metal, so that no choking will result.

Many steel manufacturers have inspected the machine, and they say that on account of the pressure that can be brought to bear on the material passing between the rolls, it is probable that a superior quality of steel can be made.—[American Engineer.

A HOPEDALE company makes screws 55-100 of an inch in diameter, one-eighth of an inch long, with 70 threads to the inch.

IRON AND STEEL WORKS AT DULUTH.

DULUTH HERALD, JULY 26.

The annual meeting of the Duluth Iron & Steel Co. was held in the office of the company yesterday, stockholders being present in person or by proxy. Secretary W. H. H. Stowell read a report, which was replete with details, and from which we are permitted to excerpt the following :

The company was organized Jan. 28, 1888, and was the outgrowth of a desire of gentlemen connected with the West Duluth Land Co., not only to improve their landed properties at West Duluth by the establishment of manufacturing institutions, but by the wish to be the pioneers in iron industries at the head of Lake Superior. This faith in Duluth as the best point for the cheap manufacture of iron was confirmed by the report of Mr. John Birkinbine, one of the leading, if not the leading, iron expert in the country, who made a thorough examination of the subject. Mr. Birkinbine was chosen as the engineer of the company to make the plans. Work was commenced in June, and contracts were made for material needed for the buildings, all with Duluth parties, who have been as low in prices as anybody, when they had the facilities to do the work. Last Fall, it was determined that the best course would be to finish work already contracted for, and to leave fire-brick work, which could not be done as well in Winter as in Summer, and which was costly until Spring.

The following materials have been used in the buildings: 48,468 cubic feet of stone, 1,341 barrels cement, 470 barrels lime, 800,000 common brick 223,000 fire-brick, 400,000 to 500,000 fire brick for hot-blast stoves. Also a pair of 12x20 hoisting engines, charging car, furnace fixtures, etc. The furnace stack is 23 feet in diameter outside, lined with over 200,000 fire-brick to 16 feet diameter inside, and 75 feet high, and is 85 feet high. The three hot-blast stoves are lined with 500,000 fire-brick, 16 feet in diameter, 60 feet high, with draught stack 40 feet more. The furnace stack has about 100 tons of iron in it, and was made in Duluth. Sixteen boilers, 36 feet long, 48x42 inches in diameter; two duplex pumps, capacity, 1,500,000 gallons each; one blowing engine, capacity, 15,000 cubic feet of air per minute, weighing over 100 tons. The draught stack is the largest in the Northwest, 135 feet high, 14 feet square at base, over 200,000 brick in it. An estimate makes the total cost approximate $175,000.

There was paid out up to July 1st, $86,099. Practically, everything is contracted for and under way and the plant can be finished this year. It will be necessary to raise $75,000 within the next sixty days.

The secretary's report was accompanied by a statement from Mr. Birkinbine, as to supplies of fuel, flux and ore required and the methods of opening. The company decide to make an additional assessment of 20 per cent. on the stockholders to provide the funds necessary for completing the plant, and it was resolved, that it is the sense of the stockholders that the directors should push the blast furnace plant to completion at the earliest practical moment, with the view of putting the same in blast during the present season.

The annual election was then held and the following managers were elected: R. S. Munger, O. P. Stearns, M. J. Forbes, J. R. Myers, A. J. Whiteman, W. H. H. Stowell, J. D. Ensign. The directors held a meeting and elected R. S. Munger, president, W. H. H. Stowell, secretary.

Foreign Industrial Notes.

English investments in Mexico seem to be increasing with the regularity of arithmetical progression. In 1886, they reached two and a-half millions sterling; in 1887, five millions, and last year, nearly eleven millions.

During the first half-year of 1889, 149 new limited companies, with a total capital of £9,100,000, were formed in the German Empire. Among these companies there are 5 railways, 18 hardware factories, and 16 mining companies. In 1888, 184 companies, with a capital of £9,650,000, were formed; and during 1887, 163 with £6,400,000, thus showing a remarkable increase year by year, especially during the current year.

An exchange states that "additional evidences are furnished every month of the gradual decay of the finished iron trade of the north of England. Many causes have tended to this end, but the principal reason is to be found in the fact that steel has slowly but surely been taking the ground. The better facilities now provided for the cheap and rapid production of steel rails have completely driven the iron-rail trade out of the market."

Japan seems to be opening up as a market for English hardwares. An intelligent merchant from Yokohama is now on a visit to England, and he tells the hardware manufacturers that the Japanese like English goods, but they will not tolerate sham or inferior articles. Good, honest work they like, and they will pay quite contentedly a good honest price for it, but nothing so much disgusts the Japanese importer as "shams" and "impostures," for which terms there are very strong equivalents in the Japanese language.—[Ironmongery.

Remarkable Fuel Economy.

The Chicago office of Westinghouse, Church, Kerr & Co. have made a remarkable showing in the line of economy at the Aurora Electric Light & Power Co., Aurora, Ill. The original plant of this company consisted of a horizontal return tubular boiler, with a good automatic engine, heater, etc., burning the best quality of lump coal, which was found to be necessary under the conditions, at an average cost of from four to five dollars per night. This plant was replaced by a Hazleton boiler, fired by two Roney mechanical stokers and a Westinghouse compound condensing engine. The company immediately went to buying the cheapest quality of slack coal, with an enormous reduction in the quantity burned. The net result, running exactly the same number of lights and for the same time, was a reduction of from $4.50 per night to 90 cents per night.

ON Saturday; Aug. 3d, the Nickel Plate will give its patrons another opportunity to visit Niagara Falls, Toronto and Chautauqua Lake. Train leaves Broadway depot at 10 P. M. $3.00 round trip. For time of trains, sleeping car berths and other information, call at 224 Bank street, 598 Pearl street and depots.

Niagara Falls via Nickel Plate.

On Saturday, August 3d, the Nickel Plate will run another Niagara Falls excursion, leaving Cleveland, Broadway depot, at 10 P. M., arriving at Niagara Falls 6:30 A. M., Sunday morning. Special train returning will leave Niagara 5:30 A. M., Aug. 5th, arriving in Cleveland early in afternoon. Tickets will be good returning until Aug. 8th. Excursionists will be furnished with tickets to Chautauqua Lake, free of charge, upon application to manager of excursion. Toronto, $1.00 extra. $3.00 for the round trip.

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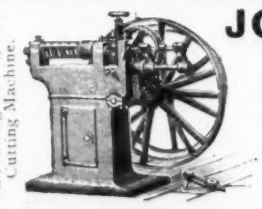

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"INTELLIGENT COOKS"

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Like human folk know what is good,
And when they have a meal to fry,
The spider "NEVER BREAK" they buy,
While those who all advice refuse,
Some other kind of spiders use,
That cracks across and breaks around,
And spills their breakfast on the ground."

[PALMER COX.]

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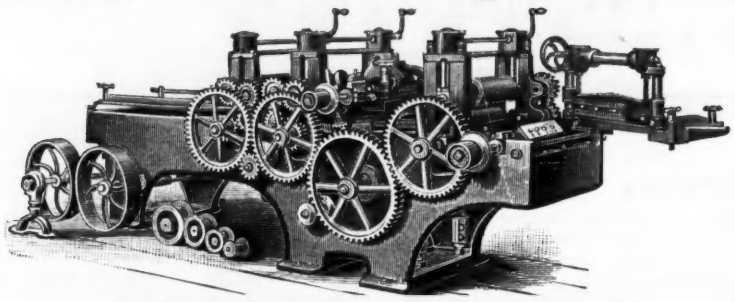

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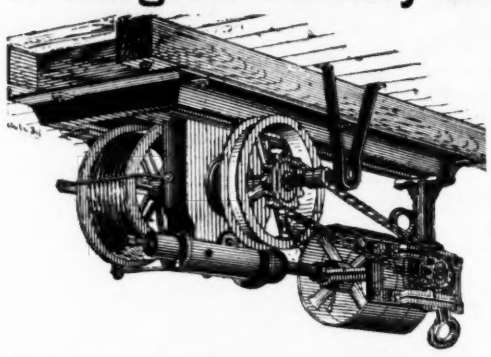

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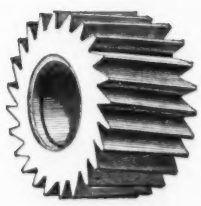

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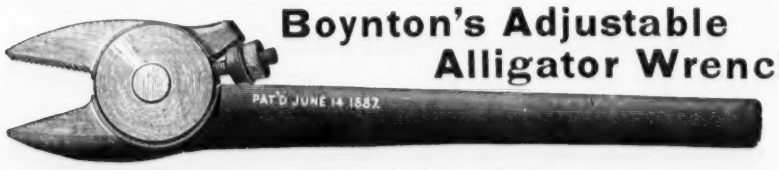

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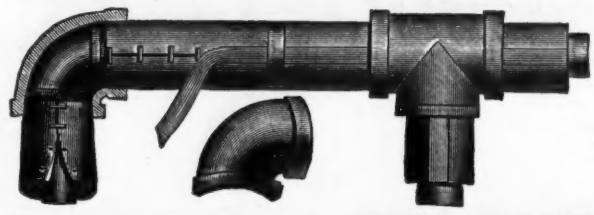

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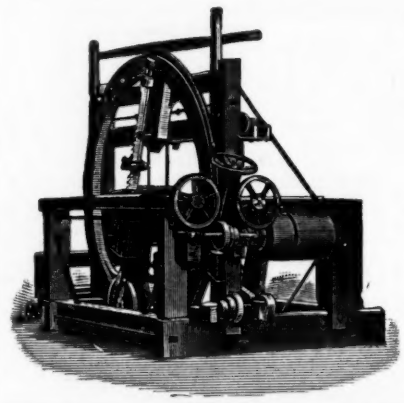

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IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, four months): Bessemer, $17 00@17 50; No. 1 Foundry, $16 15@16 65; No. 2 Foundry, $15 15@15 65; No. 1 Gray Forge, red short, $14 15@14 65; No. 2 Gray Forge, neutral, $13 65@14 15; No. 1 American Scotch, $17 40@18 05; No. 2 American Scotch, $16 40@17 05.

CHICAGO (reported by Rogers, Brown & Co.): COKE AND BITUMINOUS—Ohio H. R. Strong Softeners, No. 1, $18 00@00 00; Ohio H. R. Strong Softeners No. 2, $17 00@00 00; Ohio Jackson Co. pure Softeners No. 1, $17 50@00 00; Ohio Jackson Co. pure Softeners No. 2, $16 50 @00 00; Ohio Shawnee Valley, Pure Softeners No. 1, $17 00@00 00; Ohio Shawnee Valley, Pure Softeners, No. 2, $16 00@00 00; Ohio Black Band Softeners No. 1, $18 00@18 50; Ohio Black Band Softeners, No. 2, $17 00@17 50; Local Brands, No. 1, $16 00@00 00; Local Brands, No. 2, $15@00 00; Local Brands, No. 3, $14 00@00 00; Southern Coke, No. 1, Foundry $16 50@00 00; Southern Coke, No. 2 Foundry, $15 50@00 00; Southern Coke, No. 3 Foundry, $14 50@00 00; Southern Coke, No. 1 Softeners, $15 50@15 75; Southern Coke, No. 2 Softeners, $00 00@00 00; CHARCOAL FOUNDRY—Lake Superior, Nos. 1 and 2, $18 00@19 00 Hanging Rock, $20 00@23 00; Southern Alabama, $19 00@22 00; Southern Tennessee, $18 00@19 00. CAR WHEEL AND MALLEABLE—Lake Superior Nos. 2 to 6, $18 50@19 50; Standard Alabama, $23 00@24 00; Standard Tennessee, $19 00@20 00; Hanging Rock, Cold Blast, $26 00@00 00; Hanging Rock, Warm Blast, $21 00@23 00.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and Southern Coke No. 1, $14 75@15 25; Ohio and Southern Coke No. 2, $14 00@14 75; Ohio and Southern Coke No. 3, $13 25@13 50; Ohio Soft Stone Coal No. 1, $15 75@16 50; Ohio Soft Stone Coal No. 2, $14 75@15 50; Mahoning and Shenango Valley, $16 00@16 50; Hanging Rock Charcoal No. 1, $20 00@22 00; Hanging Rock Charcoal No. 2, $19 00@21 50; Tennessee and Alabamba Charcoal No. 1, $17 50@18 50; Tennessee and Alabama Charcoal No. 2, $16 50@17 50. FORGE—Strong Neutral Coke, $13 25@13 50; Mottled Neutral Coke, $12 50@12 75; Cold Short Coke, $13 00@00 00. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 00; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $20 00@21 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $14 75@15 25; Southern Coke No. 2 Foundry (new classification), $14 25@14 75, Southern Coke No. 3 Foundry (new classification), $13 50@14 00; Grey Forge, $13 00@13 50; White and Mottled, different grades, $12 50@13 00; Silver Grey, different grades, $13 00@13 50; Southern Charcoal No. 1 Foundry, $16 25@16 75; Southern Charcoal No. 1 Mill, $14 75@15 25; Southern Car Wheel, Standard brands, $21 75@22 75; Southern Car Wheel, other brands, $18 00@19 50; Hanging Rock Coke No. 1 Foundry, $15 50@16 00; Hanging Rock Charcoal No. 1 Foundry, $19 50@21 00; Hanging Rock Cold Blast, $20 75@22 75; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $14 75@15 25; Southern coke No. 2, $14 00@14 50; Southern coke No. 3, $13 75@14 25; Mahoning Valley (Lake ore mixtures), $17 50@18 00; Southern charcoal, No. 1, $16 50@17 00; Southern charcoal, No. 2, $16 00@16 50; Missouri charcoal, No. 1, $ 17 50@18 00; Missouri charcoal, No. 2, $17 00@17 50 FORGE—Neutral coke, $13 25@13 75; Cold short, $13 00@13 25; Mottled, $12 00@12 25. CAR WHEEL AND MALLEABLE—Southern (standard brands), $21 50@22 00; Southern (other brands), $17 50@18 00; Lake Superior, $22 00@22 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 75@16 50; Southern Coke No. 2, $14 75@15 75; Southern Coke No. 3, $14 25@14 75; Southern Grey Forge, $13 75@14 25; Southern Charcoal No. 1, $18 00@18 50; Southern Charcoal No. 2, $17 00@18 00; Missouri Charcoal No. 1, $16 00@16 50; Missouri Charcoal No. 2, $15 00@16 00; Ohio Softeners, $17 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $20 00@22 00; Southern, $19 00@23 00. CONNELLSVILLE COKE—East St. Louis, $4 40; St. Louis, $4 55.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 00@19 50; Lake Superior Coke, all Ore, $18 00@18 50; Lake Superior Coke, Cinder Mixed, $17 50@18 00; Standard Ohio Black Band, $17 50@18 50; Southern No. 1, $16 50@17 00; Southern Gray Forge, $15 00@15 50; Southern Silvery, $16 00@16 50; Jackson County (Ohio) Silvery, $18 00@18 50; Old Wheels, $18 50@19 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 00@16 35; No. 2 Foundry, $15 00@15 25; Grey Forge, $14 25@14 50; White and Mottled, $13 25@13 50; Warm Blast Charcoal, $18 00@24 00; Cold Blast Charcoal, $22 00@27 00; Bessemer, $16 25@16 50.

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1½ to 4 by ⅜ to 1 inch	1 70
4½ to 6 by ⅜ to 1 inch	1 80
1¾ to 6 by 1⅛ to 2 inch	2 10
1¾ & 1⅜ by ⅜ to ¾ inch	1 80
1 & 1⅛ by ⅜ to ¾ inch	1 80
⅛, ¾ and ⅞ by ⅜ to ⅝ inch	2 20

Round and Square.

1 to 1⅞ inch	1 70
2 to 2⅝ inch	1 90
2¾ to 3¼ inch	2 20
3⅜ to 4 inch	2 70
4¼ to 4½ inch	3 20
4¾ to 5 inch	3 40

Oval.

⅝ to 1¼ inch	2 10
⅛ to ¾ inch	2 30
⅞	2 50
⅛	2 90

Half Oval and Half Round.

1¼ to 3 inch	2 80
⅜ to 1¼ inch	2 40
⅛ to ¾ inch	2 90
⅛	3 20
⅛	4 70

Heavy Band.

⅛ to 6 by ¼ and 5-16 inch	1 95
1 to 1⅜ by ¼ and 5-16 inch	2 05
½ to ⅞ by ¼ and 5-16 inch	2 25
⅛ to ⅜ by ¼ and 5-16 inch	2 75

Hoops.

⅛ to 4, Nos. 13 to 15	2 55
⅛ to 2, Nos. 16 to 18	2 65
⅛ to 2, No. 19	2 75
⅛ to 2, No. 20	2 85
⅛ to 2, No. 21	2 95
⅛ to 2, No. 22	3 05
5-16, 1 and 1⅛, Nos. 13 to 15	2 75
5-16, 1 and 1⅛, Nos. 16 to 18	2 85
5-16, 1 and 1⅛, Nos. 19 and 20	2 95
15-16, 1 and 1⅛, No. 21	3 05
15-16, 1 and 1⅛, No. 22	3 25
⅞, Nos. 13 to 15	2 95
⅞, Nos. 16 to 18	2 05
⅞, Nos. 19 and 20	2 15
⅞, No. 21	3 25
⅞, No. 22	3 35
13-16, Nos. 13 to 15	3 15
13-16, Nos. 16 to 18	3 25
13-16, Nos. 19 and 20	3 35
13-16, No. 21	3 45
13-16, No. 22	3 55
¾, Nos. 13 to 15	3 25
¾, Nos. 16 to 18	3 35
¾, Nos. 19 and 20	3 45
¾, No. 21	3 55
¾, No. 22	3 65
11-16, Nos. 13 to 15	3 45
11-16, Nos. 16 to 18	3 55
11-16, Nos. 19 and 20	3 65
11-16, No. 21	3 75
11-16, No. 22	3 85
⅝, Nos. 13 to 15	3 85
⅝, Nos. 16 to 18	3 75
⅝, Nos. 19 and 20	3 95
⅝, No. 21	4 05
⅝, No. 22	4 15
⅝, No. 23	4 25

Light Band.

1½ to 6 by ⅛ to 3-16 in	2 25
1½ to 6 by Nos. 11 and 12	2 35
1 to 1⅜ by ⅛ to 3-16 in	2 35
1 to 1⅜ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 in	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 in	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 in	3 25
⅝ and 9-16 by Nos. 11 and 12	3 30
½ by ⅜ to 3-16 in	3 50
½ by Nos. 11 and 12	3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 75
⅞ inch, " " " 13 and 14	3 05
¾ inch, " " " 11 and 12	3 05
¾ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 50
No. 15 to 17	2 70
No. 18 to 21	2 80
No. 22 to 24	2 90
No. 25 to 26	3 00
No. 27	3 10
No. 28	3 30

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 35
C No. 1, " "	2 60
C H No. 1 " "	2 85
C H Flange, " "	3 55
Extra Flange, " "	3 95
Solid Fire Box, "	4 85

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 55
Shell	2 95
Flange	3 20
Marine Flange	3 70
Fire Box	4 35

Above includes plates 90 inches wide.

90 to 96 in. wide	½c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅝ thick	0

Bessemer and O. H. Steel.

	ct. ℔
Machinery	base price, 02¾
Tire	" 02¾
Spring	" 03¼
Sleigh Shoe	" 02¾
Toe Calk	" 03
Cutter Shoes, tapered and burr.	" 03

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	Net Ton.
No. 1 R. R. wrought scrap	$17 50
No. 1 wrought scrap	15 00
No. 1 Machine cast scrap	12 00
Stove Plate (free from burnt iron)	10 00
Grate Bars	8 50
Pipes and flues (Clean)	13 00
Tank iron	12 50
Hoop and band iron	10 00
Iron axles	24 00
Light sheet iron	10 00
Axle turnings	14 00
Wrought turning (free from cast)	12 50
Wrought iron, oily drillings	11 00
Cast borings	9 00
Malleable iron	10 00
Uncut wrought iron boilers	10 00
Steel boiler plates	14 50
Old iron T rails	gross tons 22 00
Old steel rails	18 50
Car wheels	20 00
Old copper	℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

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Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

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THE IMPROVED
Justice Spring Hammer.

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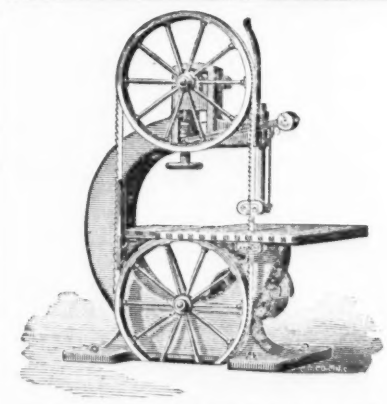
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TELEPHONE 2139
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MACHINERY SUPPLY MARKET.

Anvils.

American ..... ₰ lb 9@10
Wrights ..... ₰ lb 9½

Bellows.

Blacksmiths' { Hill's ..... dis 40
{ Bullock's .... dis 50&10
Moulders' ..... dis 40@40&10
Hand ..... dis 40&10@50

Belting.

Boston Belting Co's standard ..... dis 70@70& 5
" " " extra ..... dis 60&5@60&10
" " " best ..... dis 55
Hoyt's Short Lap ..... dis 45
Cleveland Rubber Co. extra standard dis 60&10
Shultz Raw Hide Leather Belting, single ..... dis 30
Shultz Raw Hide Leather Belting, double ..... dis 35
Standard, oak tanned ..... dis 55@60
Alexander Brothers' pure oak tanned. ... dis 45

Blowers and Exhausters.

B. F. Sturtevant's ..... dis 20
Boston Blower Co., ... dis 35
Buffalo ..... dis 35

Borax.

..... ₰ lb 9½@10½

Chalk.

White ..... ₰ gross 50
White Crayon ..... ₰ gross 12@12½ dis 10
Red ..... dis 70
Blue ..... dis 85

Chucks.

Cushman's 4 Jaw Independent ..... dis 40
" Combination ..... dis 40
" Geared Scroll ..... dis 30
" 2 Jaw Brass Workers. ..... dis 25
" Drill ..... dis 35
Wescott's Scroll Combination ..... dis 30
" Independent ..... dis 40
" Little Grant Drill ..... dis 30
Horton's Universal & Ind ..... dis 40
National Combination ..... dis 40
Sweetland " ..... dis 40
Skinner " ..... dis 40
" Independent ..... dis 40
Almond Drill ..... dis 25
Morse " ..... dis 15
Skinner " ..... dis 30

Cutters and Reamers.

Cleveland ..... dis 10@15
Pratt & Whitney ..... dis 10@15
Standard ..... dis 10@15
Brown & Sharpe, Milling Cutters ..... dis 15
" " Gear Cutters .. .. dis 15

Crowbars.

Cast Steel ..... ₰ lb 4
Iron, steel points ..... ₰ lb 3½

Drill and Drill Stocks.

Twist drills ..... dis 50&10
Morse Taper and Straight shank to 1½" ..... dis 50&10
Morse Taper and Straight shank Larger than 1½" ..... dis 25
Drill Sockets ..... dis 25
Standard ..... dis 50&10
Cleveland ..... dis 50&10
Maneer's bench ..... dis 50&25
Maneer's post ..... dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₰ lb	4 c	5 c		2½c
½ kegs ₰ lb	4¼c	5¼c		2¾c
¼ kegs ₰ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co ..... dis 40@46
H. H. Barton ..... dis 40@46

Emery Wheels.

Detroit ..... dis 50@60
Norton's ..... dis 55@60
Grant ..... dis 55@60
Union Stone ..... dis 60
Sterling ..... dis 60
Vulcanite ..... dis 15@20
Celluloid ..... dis 10
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60

Files.

Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
Arcade ..... dis 65@70
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50

Hammers.

P. S. W. ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list ..... dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¼	3½
Hexagon	15½	11½	8½	6	5¼	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₰ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887 ..... dis 70 &10
Standard Penny Nails, ₰ keg card rate
{ Car lots $2.30
{ Less than car lots $2 40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₰ doz ..... dis 10@10&10

Packing, Steam.

Boston Belting Co. ..... dis 60
American Packing Hemp ..... ₰ lb 10@11
Russia Packing " ..... ₰ lb 14
Italian Packing " ..... ₰ lb 13@14
Plumbago Piston ..... ₰ lb 40
Morrison's " ..... ₰ lb 50
Square Flax " ..... ₰ lb 70
Sheet Rubber ..... ₰ lb 12@24
Excelsior Rubber. ..... ₰ lb 48

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 45
Medart Pulleys ..... dis 55
Split Wood Pulleys ..... dis 45

Rivets.

Iron, Thousand, list November 17, ... dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 50
Copper ..... dis 50@50&10

Rope.

Manilla, ½ inch and over ..... ₰ lb 15¼
Sisal, ½ inch and over ..... ₰ lb 13¾

Sand Paper.

B. A. & Co ..... dis 40@40&10
H. H. Barton's ..... dis 40@40&10
New England Flint ..... dis 40@40&10
Barton's Garnet ..... dis 25

Saws.

Disston's Circular ..... dis 45
" Band ..... dis 20
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Disston's ..... dis 20
Atkins' Cicular Saws ..... dis 50
" Mill, Mulay and Drag Saws. dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... dis 70c per ft
" Dexter Cross-cuts ..... dis 50c "
" Diamond " ..... dis 30c "
" Tuttle Tooth Cross-cuts. dis 25c "
" One-man Cross-cuts ..... dis 32c "
No. 1 Handles ..... dis 23c per pair
No. 6 " ..... dis 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron ..... dis 50
Round head iron ..... dis 40
Flat head brass ..... dis 45
Round head brass ..... dis 35
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set C. H. C. P. ..... dis 70
Machine, flat head, iron ..... dis 55
Machine, round head, iron ..... dis 50
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

Shovels and Spades.

Ames' list November 1, 1885 ..... dis 20
Dennis ..... dis 5.25
Hussey & Binns, railroad ..... dis 8.00

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 50
Pulley Taps ..... dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls	21c	@29c
No. 18 " " ¼ and ½ "	18c	@28c
No. 36 " " ¼ and ½ "	16c	@27c
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12	@12¼c
3-Ply " 1½ lb Balls	11	@11¼c
Cotton Wrapping, 5 Balls to lb	15	@16c

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 10@15
Howard ..... dis 30
Maneer's machinist ..... dis 50&10

Wire.

New List, Jan. 18, 1884

Brass and copper ..... dis 20@25
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75& 5
" " Nos. 27@36 ..... dis 75&10& 5
Coppered Nos. 0 to 18, market list. dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... $6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanics' ..... dis 55&10,& 3
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 10
William's " " ..... dis 10
Alligator " " ..... dis 40

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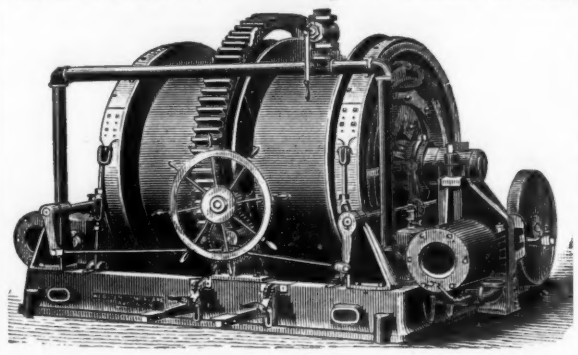

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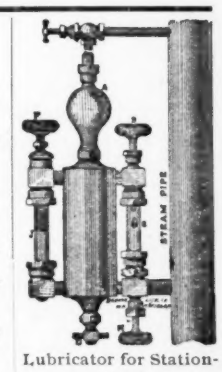

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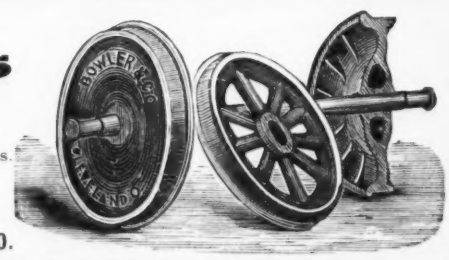

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Stronger and more durable than iron forgings in any position, or for any service whatever.

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Write for Catalogue of all styles of Steel and Wood Barrows, Hand Carts and Ware house Trucks.

LANSING WHEELBARROW CO.
LANSING, MICH.

HARDWARE MARKET.

Augers and Bits.

ommon augers and bits.....dis 70
nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩dox. $6 00@6 50
Others.....₩doz. $5 50@5 75
Full polished.....$8 00

Bolts.

Cast iron barrel bolts.....dis 70@70&10
Cast iron shutter bolts, etc.....dis 70@70&10
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70@70&10
Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 70@70&10
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10@75
Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10@75
Wrought, fast joint, broad.....dis 70&10@75
Wrought, loose joint, broad.....dis 70&10@75
Table Butts, back flaps, etc.....dis 70&10@75
Regular inside blind.....dis 70&10@75
Light inside blind.....dis 70&10@75
Loose pin.....dis 70&10@75
Light loose pin.....dis 70&10@75

Chains.

Trace, 6½-10-2.....₩ pair 1.03
Trace, 6½-10-3.....₩ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ lb5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75&5@75&10
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No.	10	9	8	7	6	
Ausable, ₩ lb.		23	24	25	26	28	dis 25&10@25&10&10
Putnam, ₩ lb.		18	19	20	21	23	dis 15
Essex							dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps,genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers.dis 60&10@60&10&10
Pitcher spout, cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 50
Bishop's O K.....₩ doz $5 50
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $3 00

Rakes.

Cast steel.....dis 65
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@[illegible]...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ dox $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

Squares.

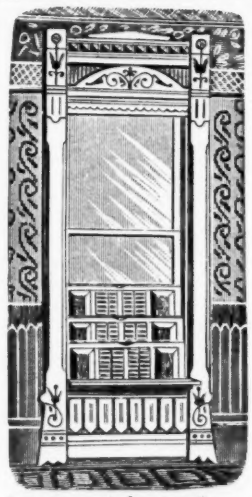
Steel and iron, Nickel plated.....dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.

American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
American iron cut tacks.....dis 75@75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10@50&10&5
Finishing nails.....dis 70&10@70&10&10
Hungarian nails and miners' tacks.....dis 70&10@70&10&10
Gimp and lace tacks.....dis 75&10@75&10&5
" " " tinned.dis 75&10@75&10&5
Trunk and clout nails.....dis 70&10@70&10&10
Tinned trunk&clout nails.dis 70&10@70&10&10
Basket nails.....dis 70&10@70&10&10
Chair nails.....dis 70&10@70&10&10
Common and patent brads.dis 70&10@70&10&10
Tinned capped trunk n'ls..dis 70&10@70&10&10

Hartman's Patent Inside Sliding Window Blind



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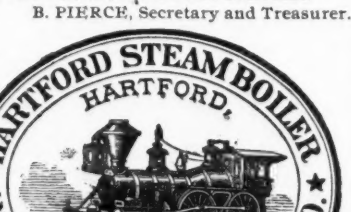

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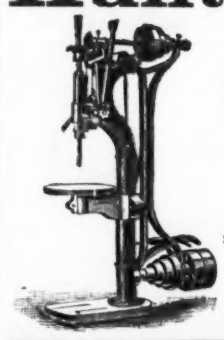

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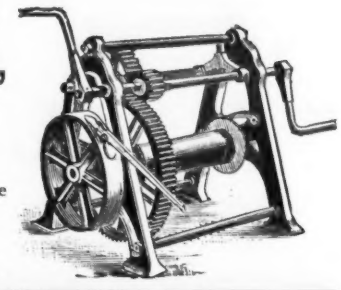

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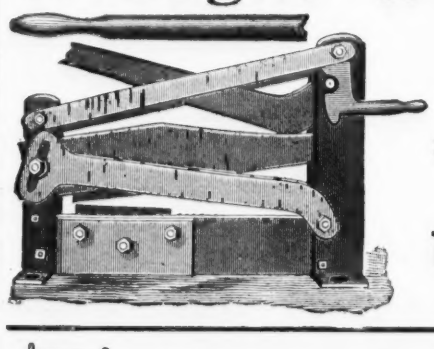

This machine will cut 4 x ⅝ flat Iron and 1⅛ in. round or square.
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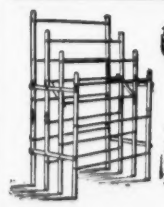

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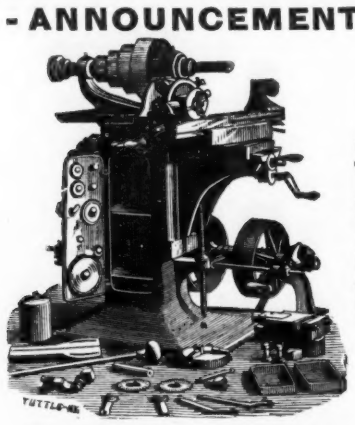

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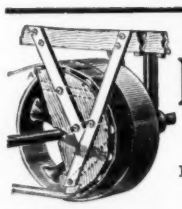

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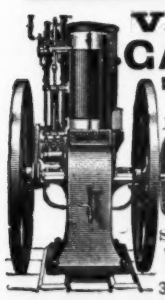

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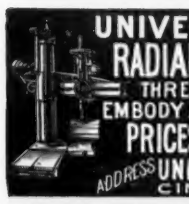

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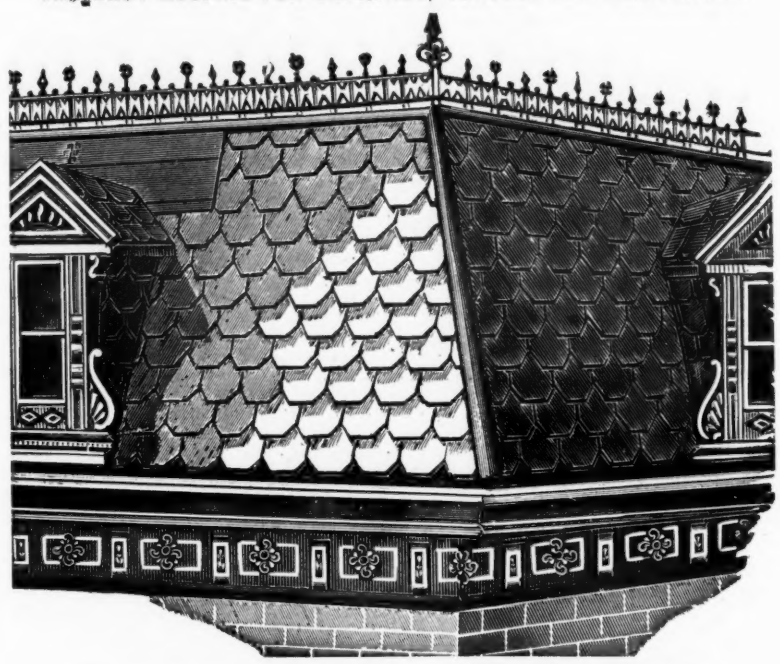

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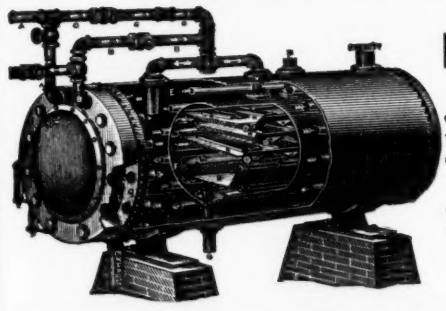

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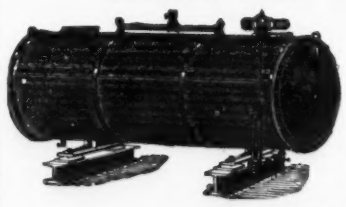

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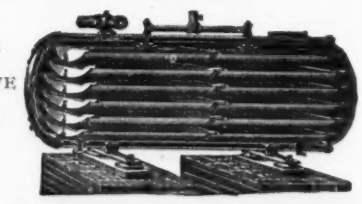

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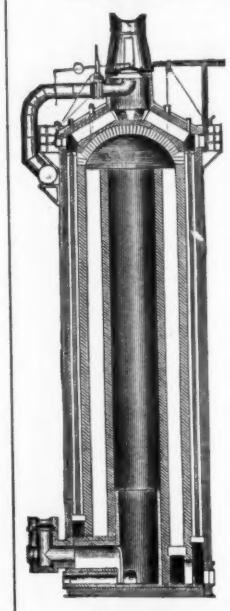

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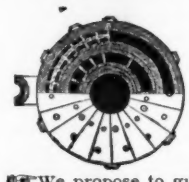

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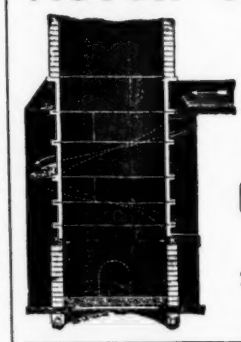

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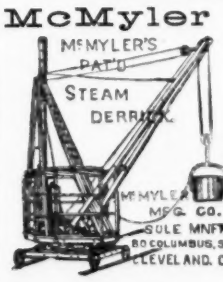

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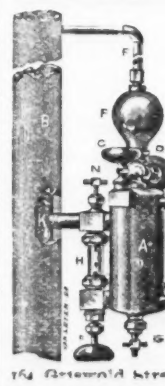

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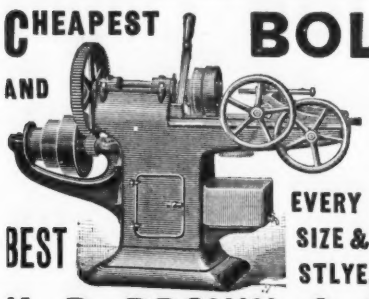

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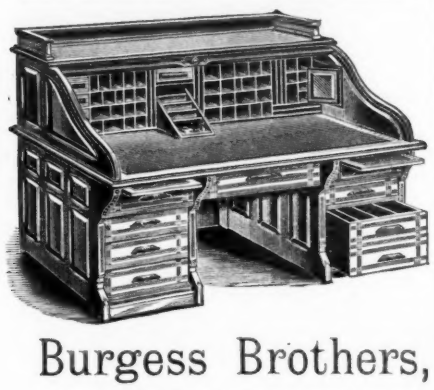

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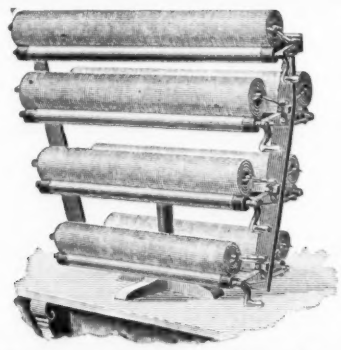

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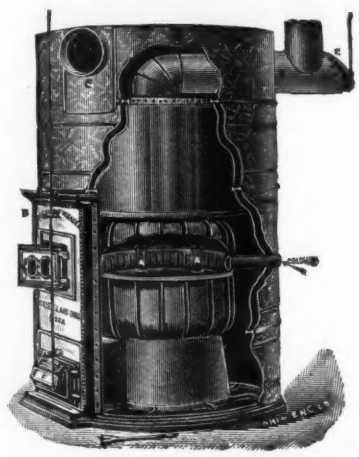

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Eastward.	Arrive.	Depart.
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 30 p m	.....
Westward.	**Arrive.**	**Depart.**
Chicago Passenger	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:20 a. m.; 4:55 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express	12 50 p m	7 45 a m
New York Express	6 35 p m	1 05 p m
Alliance & Akron Accom	9 35 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	7 00 a m	8 00 p m
Akron, Col. & Zanesv'e Ex	12 50 p m	1 05 p m
Akron & Orrville Accom	9 35 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

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Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo	.....	†6 40 a m
Pittsburgh Express	†6 25 p m	.....
Youngstown Local	†8 05 a m	.....
Mahon'g div. & Pitts Local	.....	*11 40 a m
Mahoning Val. Accom	.....	†4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:30 a. m., 4:05 p. m.
Canton—6:30 a. m., 8:50 a. m., 1:15 p. m., 4:05 p. m.
Kent—6:30 a. m., *8:50 a m., 1:15 p. m., 4:05 p. m., *8:15 p. m.
Bedford—6:30 a. m., *8:50 a. m., 11:20 a. m., 1:15 p. m., 2:00 p. m., 4:05 p. m., 5:45 p. m., *8:15 p. m.
Newburgh—6:10 a. m., 6:30 a. m., *8:50 a. m., 11:20 a. m., 1.15 p. m., 2:00 p. m., 4:05 p. m., 4:40 p. m., 5:45 p. m., *8:15 p. m.
Canton and intermediate stations (Sundays only), 8:00 a. m., 4:15 p. m.

Arrive from—

Zanesville and Coshocton—9:50 a. m., 6:25 p. m.
Canton, 9:30 a. m., 11:30 a. m., 7:00 p. m.
Kent—*7:40 a. m., 9:30 a. m., 11:30 a. m., 7:00 p. m., *7:15 p. m.
Bedford—6:00 a. m., *7:40 a. m., 9:30 a. m., 11:30 a. m., 1:05 p.m., 4:15 p. m., 7:00 p.m., *7:15 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *7:40 a. m., 9:30 a. m., 11:30 a. m., 1.05 p. m., 4:15 p. m., 5:35 p. m., 7:15 p. m., *7:15 p. m.
Canton and intermediate stations (Sundays only), 9:50 a. m., 6:20 p. m.

Trains marked * run daily.

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	Depart.	Arrive.
Valley Junction Mail	*7 40 a m	*6 20 p m
Marietta Express	†11 15 a m	†2 20 p m
Valley Junction Express	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 10 a m

*Daily. †Daily, except Sunday.

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No. 72, Fast Pittsburgh Express	* 8 10 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Mantua Accommo	* 4 20 p m
No. 68, New York Vestibule Limited	* 8 25 p m
No. 70, Pittsburgh Local Express	*11 25 a m
No. 74, Jamest'n, Pitts. & Y'ngst'n Ex	† 4 20 p m
	Arrive.
No. 65, Fast New York Express	*10 05 a m
No. 61, N. Y. & Pittsburgh Express	* 7 15 a m
No. 71, Youngstown Local	* 2 10 p m
No. 67, Pittsburgh Express	†12 30 p m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 8 55 p m
No. 73, Mantua Accommo	* 7 20 p m

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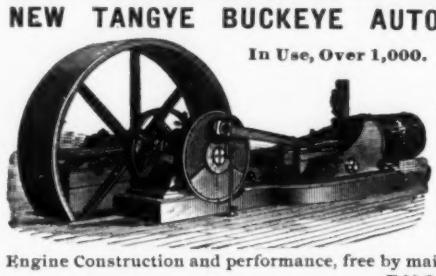

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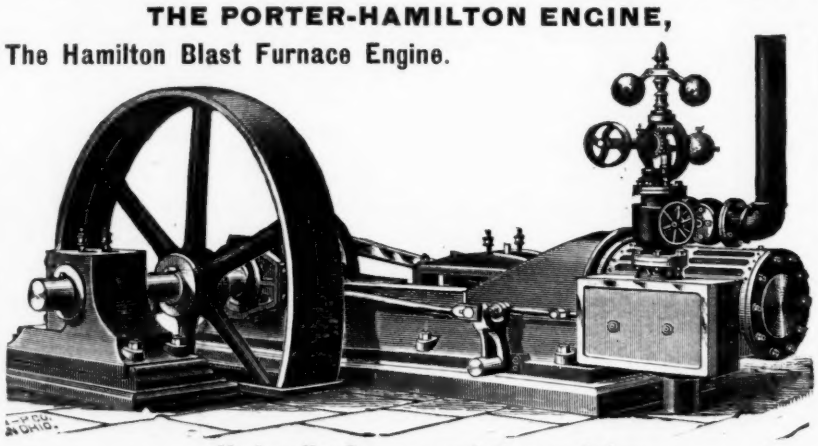

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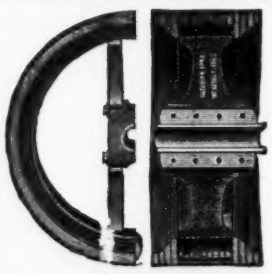

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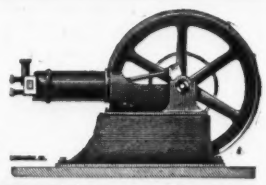

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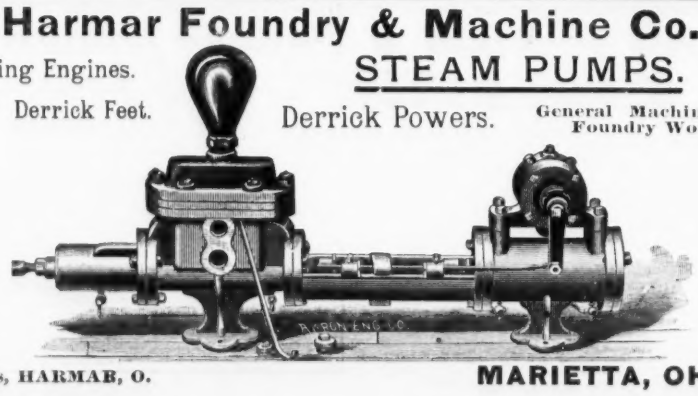

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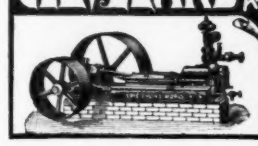

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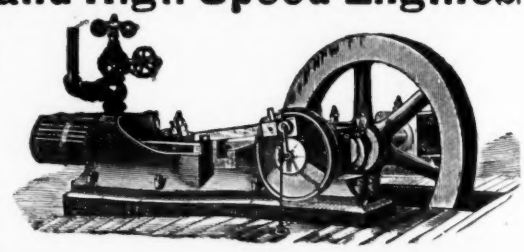

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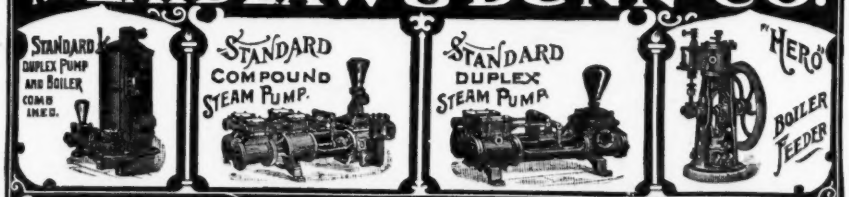

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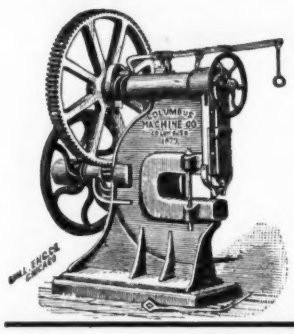

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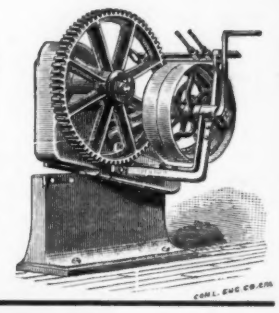

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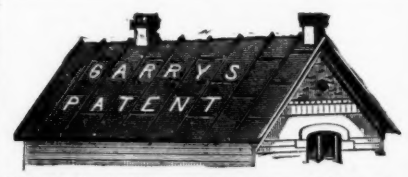

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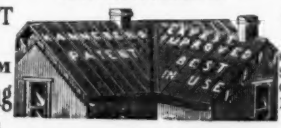

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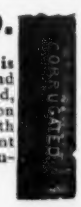

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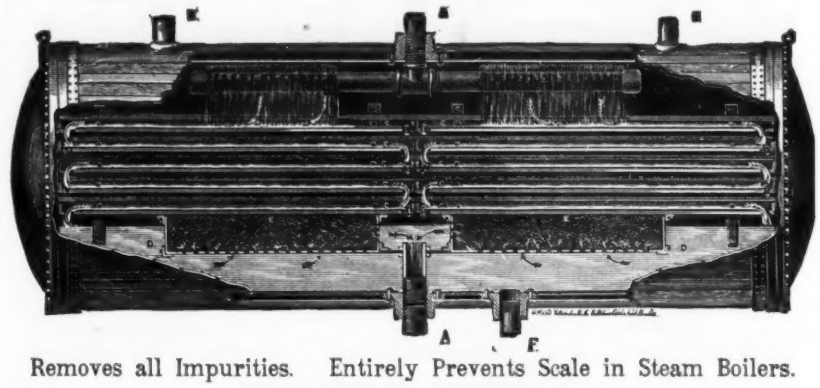

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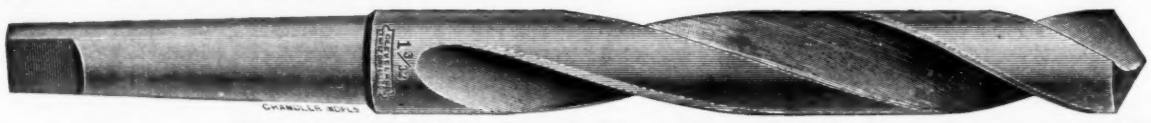

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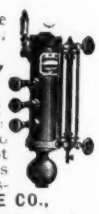

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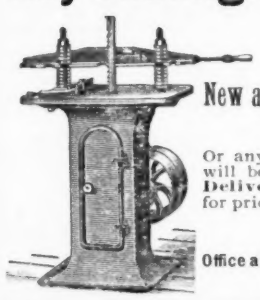

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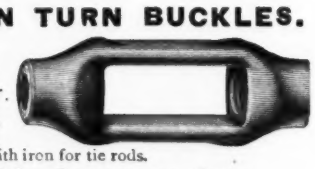

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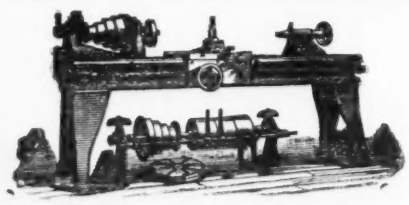

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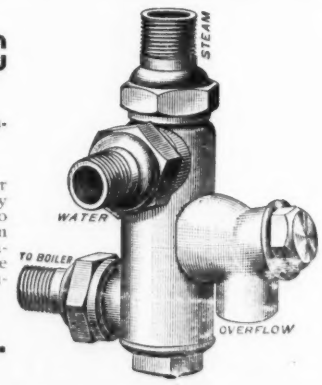

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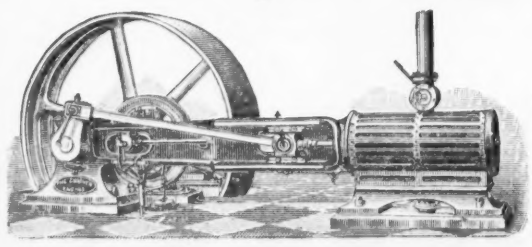

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